

POPULAR MECHANICS MAGAZINE

WRITTEN SO YOU CAN UNDERSTAND IT

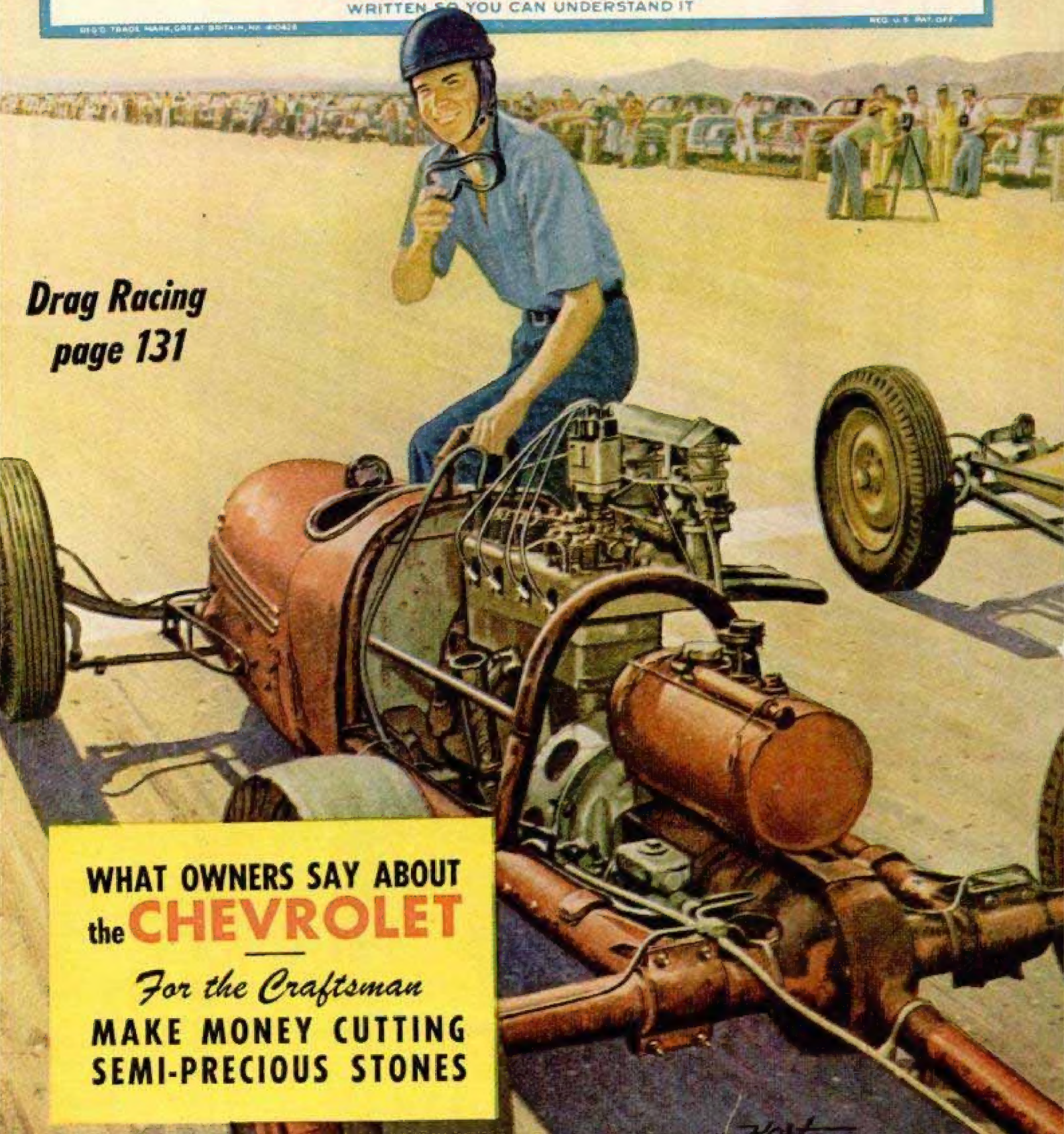
REG. TRADE MARK, GREAT BRITAIN, NO. 40428

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Drag Racing
page 131

WHAT OWNERS SAY ABOUT
the **CHEVROLET**

For the Craftsman
**MAKE MONEY CUTTING
SEMI-PRECIOUS STONES**



Attention...owners of

PLYMOUTH • DODGE • DE SOTO

CHRYSLER • DODGE "Job-Rated" TRUCKS

Ask your dealer for

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Chrysler Corporation
parts and accessories*



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The men who know your car or truck best . . . your nearby Plymouth, Dodge, De Soto and Chrysler dealers . . . all agree there's no substitute for genuine Chrysler Corporation parts and accessories. *That means MoPar!* So whenever you need service, deal where you see the MoPar sign. It is proudly displayed almost everywhere you can drive.



**CHRYSLER CORPORATION,
PARTS DIVISION • DETROIT 31, MICHIGAN**

SO MY WIFE SAID: "Don't stop with the vestibule!"

"I had heard about Goodyear VINYL•TILE, the new pre-polished flooring material that never needs waxing—so I decided to install it myself in our small vestibule, where the kids are always tracking in with muddy feet.

"But I hadn't even finished putting down the VINYL•TILE when my wife said: 'It's beautiful! Don't stop with the vestibule—let's spruce up other rooms too!'

"Well, who was I to argue? Installing VINYL•TILE is so simple, it's easy to do it yourself.

"So now we've finished the kids' rooms — and the dining area is next. The only problem is deciding which of the 18 smart colors to use!"

Why not send for the free VINYL•TILE "Self-Installation" booklet? It shows the step-by-step method of installing your own floor. Send a postcard to:

Goodyear, Flooring Dept. 7-M,
Akron 16, Ohio

Flor-Master — T. M.
The Goodyear Tire & Rubber Company, Akron, Ohio

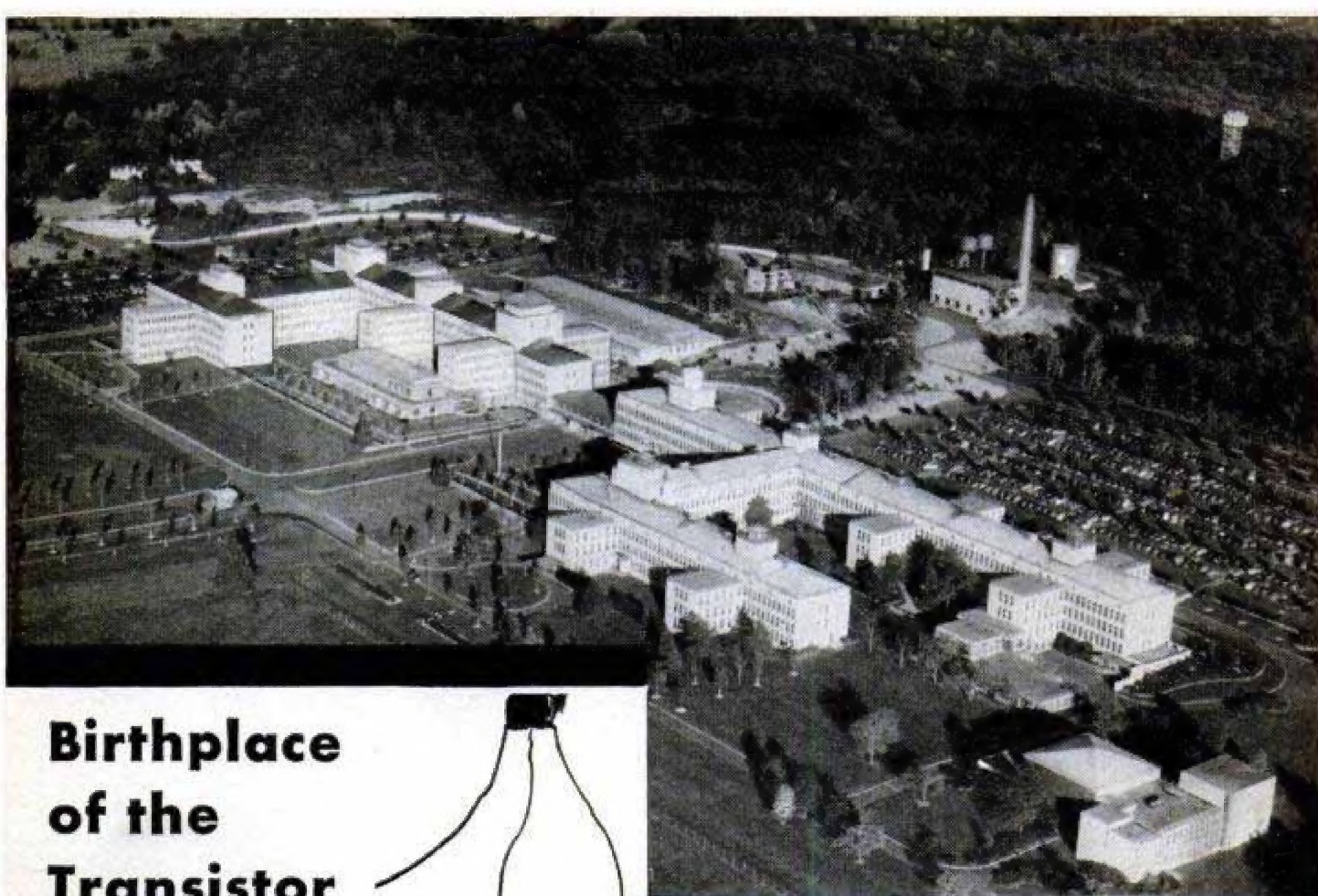


HANDY GOODYEAR VINYL•TILE FLOR-MASTER INSTALLATION KIT provides the simple tools required to do a professional job in jig time—available at all better dealers' where Goodyear VINYL•TILE is a featured item.

GOODYEAR Vinyl-Tile

By the Tile • By the Roll • FOR FLOORS • WALLS • COUNTER TOPS

We think you'll like THE GOODYEAR TELEVISION PLAYHOUSE—every other Sunday—NBC TV Network



Birthplace of the Transistor

The **Transistor**, that revolutionary new electronics device, is a product of *telephone* research. It was conceived, invented and developed at Bell Telephone Laboratories by men in search of ways to improve telephone service. It was announced just five years ago.

The **Transistor** can do most of the things that vacuum tubes can do—and others, too—but it is not a vacuum tube. It works on entirely new physical principles. Rugged, simple and tiny, the Transistor uses incredibly small amounts of power—and then only when actually operating.

Transistors promise smaller and cheaper electronics equipment and the spread of electronics where other equipment has not been able to do the job as economically. They are already at work in the Bell System, generating the signals that carry dialed numbers between cities, and selecting the best route for calls through complex switching systems. Engineers see many other possibilities: for example, as voice amplifiers in telephone sets to aid the hard of hearing, and as switches.

Bell Telephone Laboratories at Murray Hill, N. J. Other laboratories are in New York City and at Whippany and Holmdel, N. J.

Recognizing the tremendous possibilities of the **Transistor** in every phase of the electronics industry, the Bell System has made the invention available to 40 other companies. Thus, again, basic research to improve telephony contributes importantly to many other fields of technology as well.

TRANSISTOR SUMMARY

Basically, a **Transistor** is a tiny wafer of germanium with three electrodes, over-all about the size of a coffee bean.

It can amplify signals 100,000 times on much less power than a pocket flashlight requires. This opens the door to its use in smaller telephone exchanges where vacuum tube equipment would be too costly to operate.

Unlike a vacuum tube, the **Transistor** has no vacuum and no filament to keep hot. It operates instantly, without "warm-up" delay. The Transistor can also be used as an electric eye and to count electrical pulses.



**BELL TELEPHONE
LABORATORIES.**

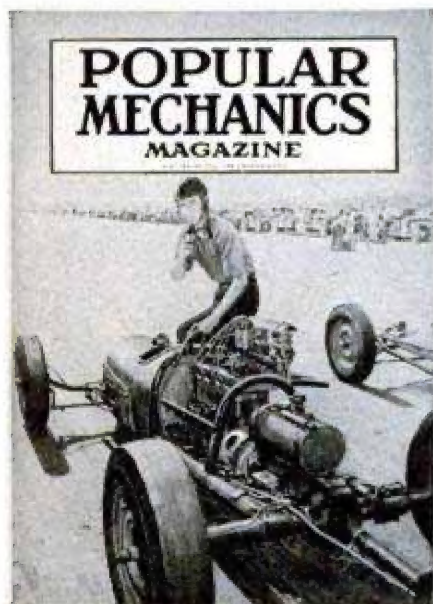
*Improving telephone service for America provides
careers for creative men in scientific and technical fields*

Popular Mechanics Magazine

Registered in U. S. Patent Office and Canada

H. H. WINDSOR, Founder

H. H. WINDSOR, JR., Editor and Publisher



this month's cover

LIGHTNING is about to strike the drag strip. Moments after this lad climbs into the cockpit he'll be roaring down the smooth concrete at a speed as high as 125 miles per hour. He's racing to shave a split second off the timer's clock, for this is no wild bout between drivers, but a coolly calculated attempt to pilot a car over a given distance at its very top speed. The vehicle this lad is driving is a special job with little more than a rear engine and four wheels. The next lad to flash down the strip may be riding a streamlined scooter with a souped-up engine; and behind him may come the proud owner of a 1923 Model T, who is merely curious about his "new" car's top speed. There are an estimated 30 drag strips scattered across the country, and they are making a real contribution to highway safety by eliminating street racing. On page 131 you'll find a feature on these strips and the excited young drivers

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Other items, and manufacturers of available products described, are listed on pages 12, 14 and 16

Save Money!

You can install a beautiful

KENTILE FLOOR

like this for only \$22⁹⁰*



A KENTILE FLOOR LIKE THIS COSTS \$8 TO \$20 LESS THAN TILE FLOORS OF MANY OTHER MATERIALS...YET KENTILE IS GUARANTEED!



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Compare for price... beauty... easy cleaning and long wear... and you'll choose Kentile. Not even the hardest kind of use can dull this floor. The 25 "new-as-tomorrow" colors can't wear off...they go clear through the tough, durable tile. Just mop and wax occasionally—you'll see Kentile sparkle like new. Because Kentile gives more value, it's preferred by more people than any other resilient tile.

* Price quoted is for a floor 14' x 7' installed by you. Your floor may cost less or slightly more depending on size, colors and freight rates. See your local Kentile Dealer for FREE estimate. He's listed in your classified directory under FLOORS. In Canada, T. Eaton Co., Ltd.

KENTILE, INC., 58 2nd Ave., Brooklyn 15, N. Y.



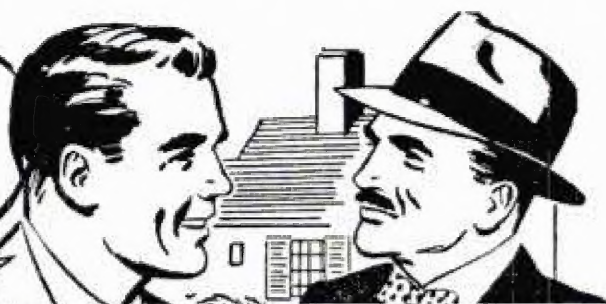
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The Asphalt Tile of Enduring Beauty



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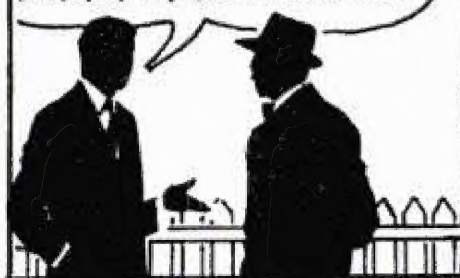
HOW CAN AN OIL PAY FOR ITSELF?



BY SAVING ENOUGH
ON GAS TO BUY YOUR
OIL CHANGE

HERE'S HOW: MACMILLAN
XTRA HEAVY DUTY OIL
REDUCES ENGINE FRICTION...
GIVES YOU MORE MILES FROM
EVERY GALLON OF GAS

PREVENTS
HYDRAULIC VALVES
FROM STICKING



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THIS ALL-PURPOSE OIL
ARE SAVING WEAR
AND TEAR AND REPAIR
BILLS

KEEPING YOUR CAR
NEWER, LONGER

STOP WHEN YOU SEE
THE BIG, RED M AT
ANY DEALER'S. FROM
COAST-TO-COAST, 25,000
OF THEM! STOP
TODAY!



THE regular, normal, continuous use of Macmillan Xtra Heavy Duty Oil saves you so much on gas! By reducing engine friction, it saved an average of 8% of gas in tests made in hundreds and hundreds of cars.

Over an average change period that means enough saving to pay for a refill of Macmillan Ring-Free Xtra Heavy Duty Motor Oil.

LOOK AT THESE FIGURES:

Average oil drain..... 1500 miles
At 15 miles per gal., gas consumed... 100 gallons
8% saving on 100 gallons gasoline... 8 gallons
Gasoline average cost*... 28.63 cents per gallon
Savings (.08 x 28.63¢)..... \$2.29

*Includes premium and regular grade.

This \$2.29 more than pays for your oil
drain of 5 quarts at 45¢[†] per quart.

([†]Slightly higher in some areas)

Start using Macmillan Xtra Heavy Duty Oil for any reason, but keep on using it month in and month out because it removes carbon, reduces ping, prevents hydraulic valves from sticking, reduces engine friction, saves on wear and tear and repair bills and makes

your car stay newer longer.

Use Macmillan Ring-Free Xtra Heavy Duty Motor Oil regularly because it pays for itself in the gas it saves.

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President

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N

A.

LIKE MOST MOTORISTS YOU WILL EVENTUALLY Switch to Pyroil

FOREVER and EVER

**Because Pyroil is the FINEST
additive for ANY gas or oil...**

Sure, there are all kinds of additives on the market. But they're not all the same, despite the ballyhoo. Like anything else, it's the ingredients and the results that count. Only PYROIL will give your motor ALL the results and protection your car needs.

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It costs less than \$1.00 to give your motor a Pyroil treatment. When you add Pyroil—you add the best for less—and your car deserves the best. It may save you hundreds of dollars in wear and tear and repair.

Try Pyroil today—for a smoother running motor as you drive on your way.

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Use Aircraft Pyroil B for lubricating oil, Aircraft Pyroil A for gasoline.

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- ☐ Send FREE Pyroil metal savings bank (postage-paid). Holds up to 50c in coins (a miniature of actual PYROIL can). Mention name of car you drive.

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Address _____

City or Town _____ State _____

Make of car _____



in this corner.....

THE EDITORS



Presenting Leo Donovan

We take pleasure in introducing the new editor of the Detroit Listening Post, Leo Donovan of Detroit.

This page of automotive news and comment has been one of our most popular monthly features since its inception early in 1950. Until now it has been written by



LEO DONOVAN

Siler Freeman, who was automobile editor of the *Detroit Times*. Mr. Freeman recently was appointed to a new editorial post with *Motor Magazine* and has severed his newspaper and PM connections, with regret on his part and ours.

Leo Donovan, who covers the automobile industry for the *Detroit Free Press*, has been a "Motor City" newspaperman for 30 years. Along the way he has had time to travel in every state of the Union as well as Canada, Mexico, Belgium, France, Germany, Switzerland and Italy, plus Alaska, Tokyo, Korea and Hawaii.

Our new automotive correspondent is a step ahead of Eddie Cantor. He and Mrs. Donovan have five daughters—and a son.

Leo Donovan's first report from Detroit appears in this issue on page 98.

(Continued to page 8)

This **FREE SAMPLE LESSON** will prove you can become an expert **BOOKKEEPER...ACCOUNTANT** **OR C.P.A.**

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We offer you this free sample lesson so that you can *prove to yourself* that you **CAN** master Accountancy—quickly, thoroughly—in spare time at home.

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HIGHER ACCOUNTANCY

By the LaSalle Problem Method...

• Practical Accounting

Assignment 1

THE BALANCE SHEET

QUOTING from the "Journal of Accountancy," the authoritative organ of the professional accountants of the United States:
"...the accounting profession is probably the best paid in the world. If there be a profession in which the average compensation is higher, it is not known to us."
"There is need for accountants. There is ample compensation for accountants. There is no prospect that the supply will overtake the demand within the lifetime of even the youngest of us."

LaSalle Extension University
A Correspondence Institution
CHICAGO

This well-paid
LaSalle-trained
Accountant's
success could
be yours.



THIS SAME LESSON HAS STARTED HUNDREDS OF THOUSANDS toward well-paid accounting careers—in business, government, and as C.P.A.'s. Even without previous knowledge, progress is rapid—earning power climbs fast. This sample lesson shows why.

If you have been envying the high incomes and good jobs enjoyed by thousands of men and women Accountants today... incomes ranging from \$4,000 to \$10,000 and more per year... why not launch such a career for yourself?

Do you doubt that you can?

Then let us send you—without cost or obligation—the same Lesson Number One with which LaSalle has started several hundred thousand

men and women toward successful accounting careers. We want you to see for yourself how this remarkable method, originated by LaSalle, makes Accountancy simple, interesting, practical, and certain... how it leads you step-by-step to a complete mastery of Accounting—and on up to the coveted degree of Certified Public Accountant if you so aspire.

It doesn't matter whether you've had previous bookkeeping experience, or whether you don't know a debit from a credit. Whether you wish to qualify as an expert bookkeeper, advanced accountant, cost accountant, auditor, government accountant, income tax specialist, or public accountant... you'll find in LaSalle's Problem Method the exact plan to prepare you rapidly and inexpensively—in spare hours at home—without losing a day from your present job.

So right now, today... if you are an adult, employed, and earnestly ambitious for rapid advancement in this highest-paying of all professions... send your name and address on the coupon below. We'll send the free sample lesson—plus our 48-page book outlining today's career opportunities and how you can qualify for them. A coupon like this has started many thousands toward greater success. It can do the same for you. Mail it today!

Clip Coupon... Mail TODAY!

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YES, I want to see how LaSalle's "Problem Method" works... how I can qualify for high-pay Accountancy positions. Send Free Sample Lesson—also your 48-page book, "Accountancy, the Profession That Pays"—all without cost or obligation.

Name..... Age.....

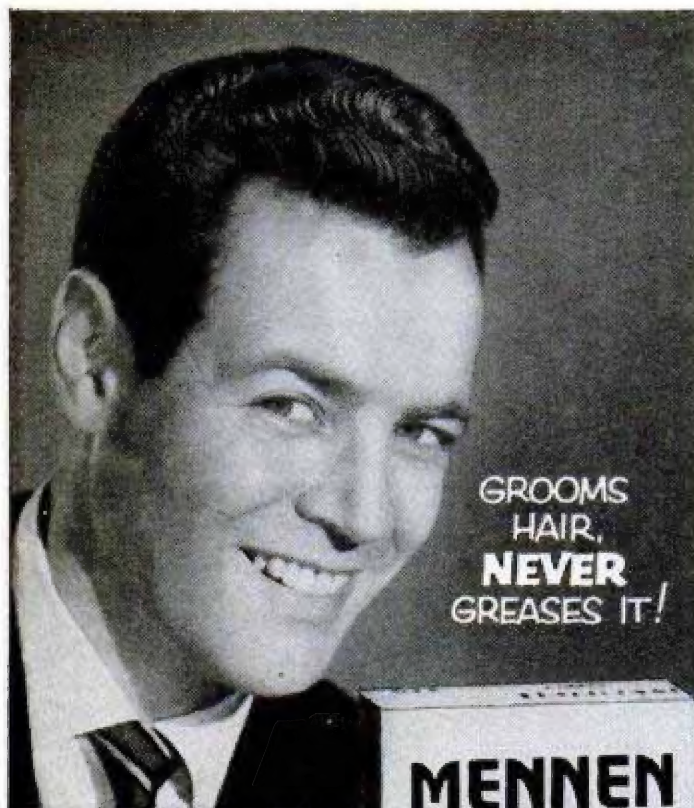
Street Address.....

City, Zone & State.....

Present Position.....



Keeps hair in place -leaves no trace!



AT LAST, a hair groom that keeps your hair neat, well-groomed, good-looking, and yet never leaves a tell-tale trace! Change today to Mennen Cream Hair Oil. It's lightly blended to groom hair, but never grease it. Contains lanolin. Helps remove dandruff scales and relieve dry scalp. Economical, too. Get a bottle today!

MENNEN CREAM HAIR OIL FOR MEN

(Continued from page 6)

To the Editor:

In a letter to the editor in your April issue, Mr. Willock and Mr. Davenport ask "Why cannot some manufacturer bring back the old Model-A?"

This question holds a special significance for me as I have recently organized a national club known as "Model A Restorers Club" and our sole purpose is the preservation and restoration of the Model-A Ford.

William E. Hall,
71 Lexington Road,
West Hartford, Conn.

To the Editor:

A traffic stopper along the highway just west of Watertown, S.D., is this giant pheasant made of five tons of concrete,



parked out in front of the service station of W. A. Walters of Tinkertown.

The gasoline dealer built it 9 feet high and 16 feet long. Tourists—especially the youngsters—delight to have their pictures taken astride the colorful "world's largest pheasant."

Harry J. Miller,
Philadelphia, Pa.

To the Editor:

I have read with interest the informative article entitled "UN's World Capitol" (PM, April 1953), and I congratulate you for a most instructive piece of work.

Henry Cabot Lodge, Jr.,
U. S. Ambassador to the United Nations.

To the Editor:

I have just seen the article on the flying saucer (PM, May 1953, page 138) and I would like to correct a slight mistake in the caption of the heading photograph. Mr. V. E. Wood is not the inventor of the Disc-us but merely carried out some of the test

(Continued to page 10)

They claim this coupon brings you "good luck"



"Six months after mailing the coupon, I had a promotion and a big raise in pay!"



"From the moment I marked the coupon, my luck changed!"



"My break came when I sent the coupon!"



Is it LUCK? The results are so impressive, so quick in coming, that some say the I.C.S. coupon is "lucky." Of course, that's not true. The real reason for these amazing results is what happens to the person when he or she mails the coupon.

Coupon is first step! Naturally, you want to make good. But you've put off doing something about it. Mailing this coupon is *definite action!* It shows you're fed up with waiting for the breaks. You're determined to make your own breaks! And this determination alone accounts for much of the "luck" you'll start to experience.



You get free guidance! Within a few days you get the helpful and inspiring 36-page book, "How to Succeed." It's crammed with information. For example, it tells you in detail how to plan your career. Also how to prepare for advancement. In addition, you get a free catalog on the I.C.S. course that interests you. With your new-found determination and these two books as your guides, you're ready to cash in on your hidden abilities!

391 I.C.S. courses! You'll find a partial list of courses in the coupon below. Each course is up-to-date, extremely practical, completely success-tested. You study in your spare time. Set your own pace. Correspond directly with instructors. Cost is low. Diplomas are awarded to graduates. I.C.S. training rates high in all fields of business and industry. You won't find another school like it.

Call it being "lucky" or being "smart." Whatever it is, you're one step closer to your goal when you mail this famous coupon!

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Without cost or obligation, send me "HOW to SUCCEED" and the booklet about the course BEFORE which I have marked X:

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| <input type="checkbox"/> Commercial Art | <input type="checkbox"/> Steam Fitting | <input type="checkbox"/> Civil Engineering | <input type="checkbox"/> Mathematics | <input type="checkbox"/> Stationary Fireman |
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| <input type="checkbox"/> Arch. Drafting | <input type="checkbox"/> Sales Management | ELECTRICAL | <input type="checkbox"/> Gas—Electric Welding | <input type="checkbox"/> Rayon Manufacture |
| <input type="checkbox"/> Building Contractor | <input type="checkbox"/> Salesmanship | <input type="checkbox"/> Electrical Engineering | <input type="checkbox"/> Heat Treatment—Metallurgy | <input type="checkbox"/> Woolen Manufacture |
| <input type="checkbox"/> Estimating | <input type="checkbox"/> Traffic Management | <input type="checkbox"/> Electrician | <input type="checkbox"/> Sheet Metal Work | <input type="checkbox"/> Loom Fixing |
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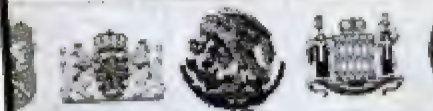
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George P. Harris,
1815½ Altura Pl.,
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celebrated Bad Ems in the French zone is another leaning tower of interest to tourists.

In the Middle Ages, Dausenau surrounded itself by a wall with seven towers, two of them connected by a gate. When the gate and one tower, originally built about 1348, were removed, its twin tower began to tilt. Napoleon, in 1803, deepened the street and the inclination increased gradually. Its tilt became so dangerous in recent years that the city fathers last year determined to remove about 20 feet of the upper part of the tower to prevent its toppling.

Hans F. Kutschbach,
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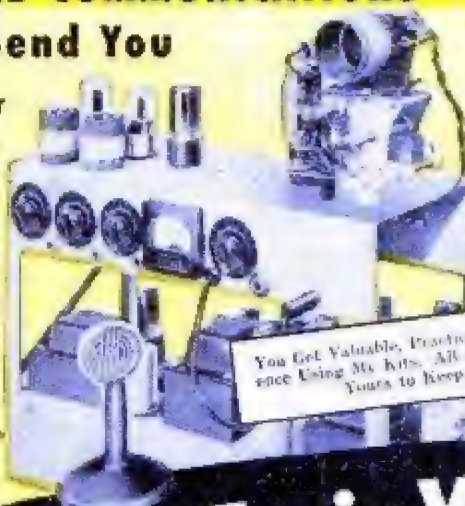
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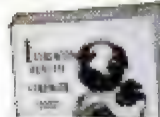
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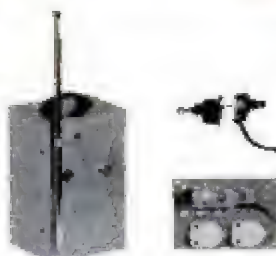
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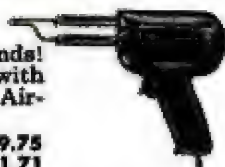
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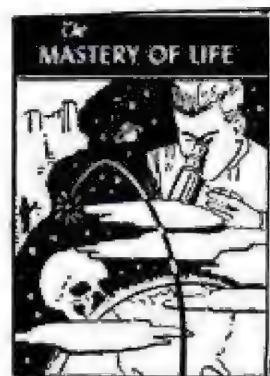
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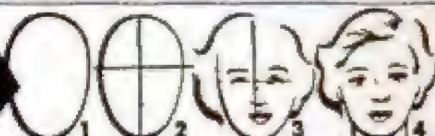
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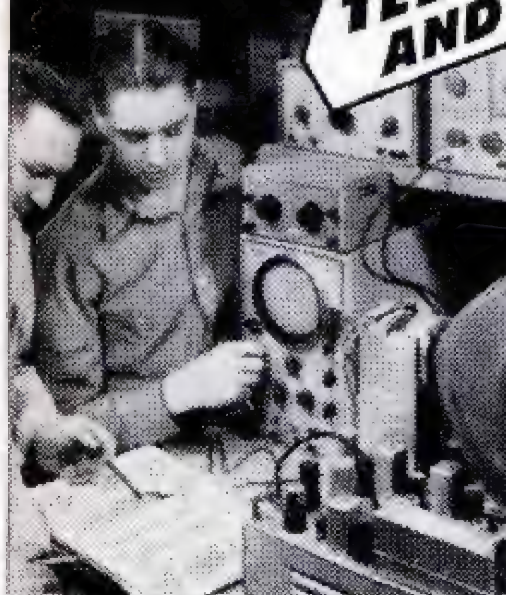
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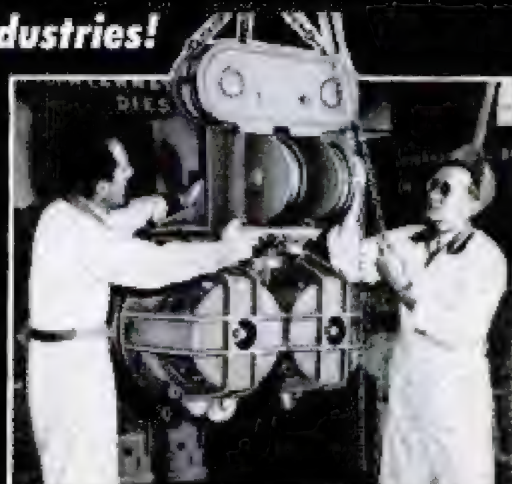
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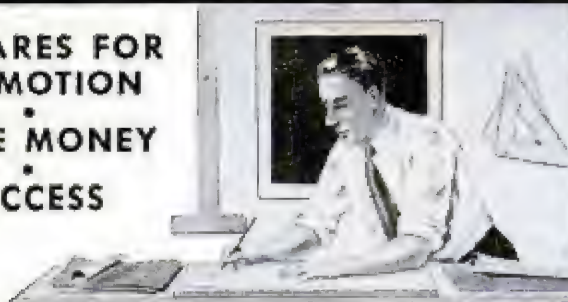
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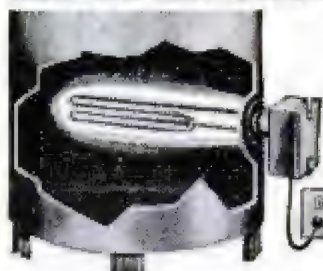
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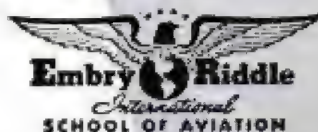
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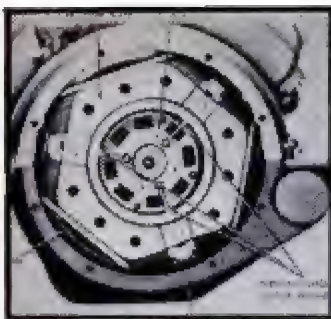


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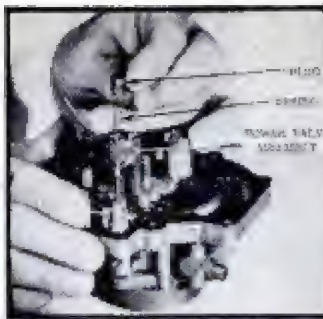
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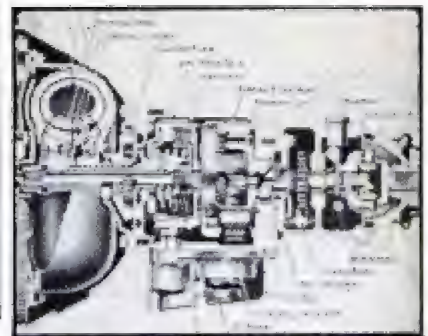
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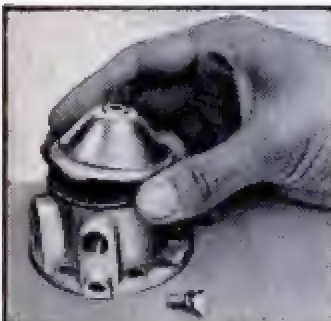


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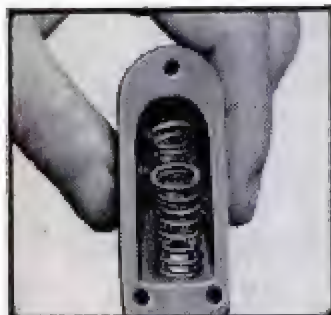


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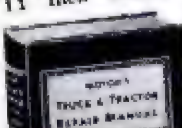
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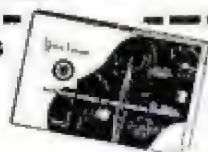
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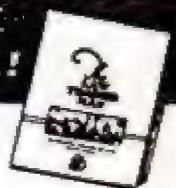
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525-18	4.72	820-15	6.62	800-20	8.72	1100-20	19.52
550-17	4.72	670-16	6.32	650-20	10.22	1000-22	19.42
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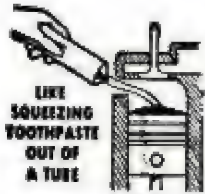
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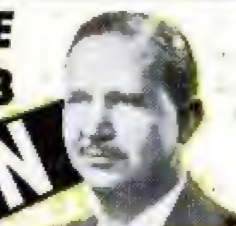
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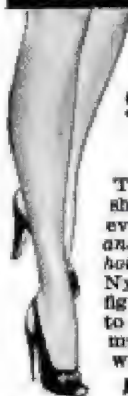


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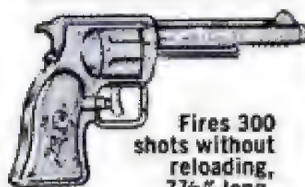
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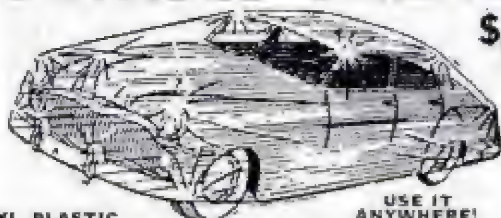
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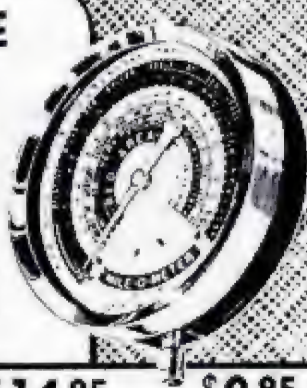
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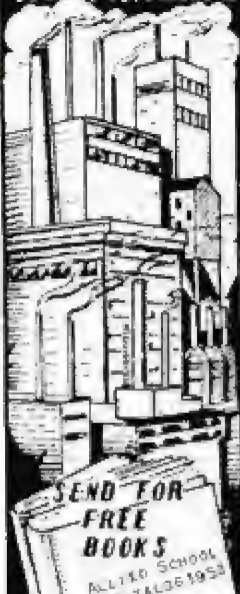
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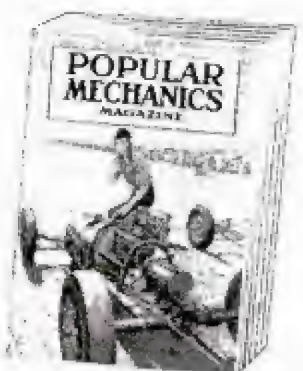
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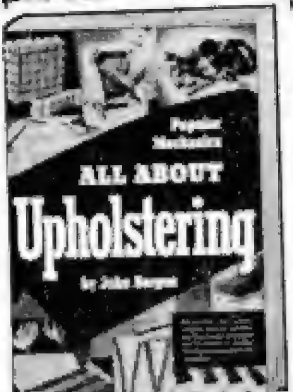
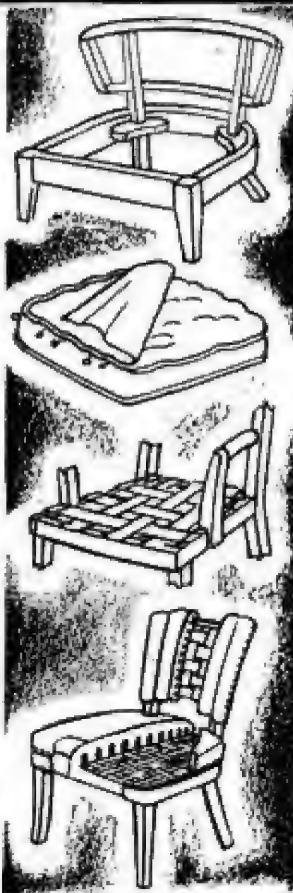
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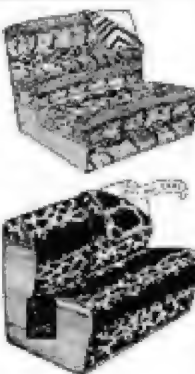
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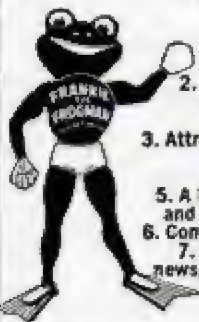
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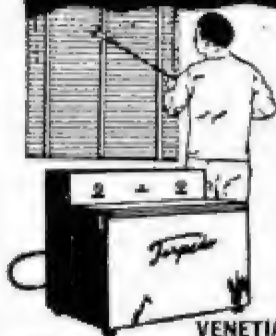
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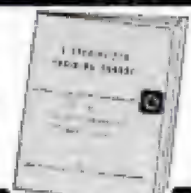
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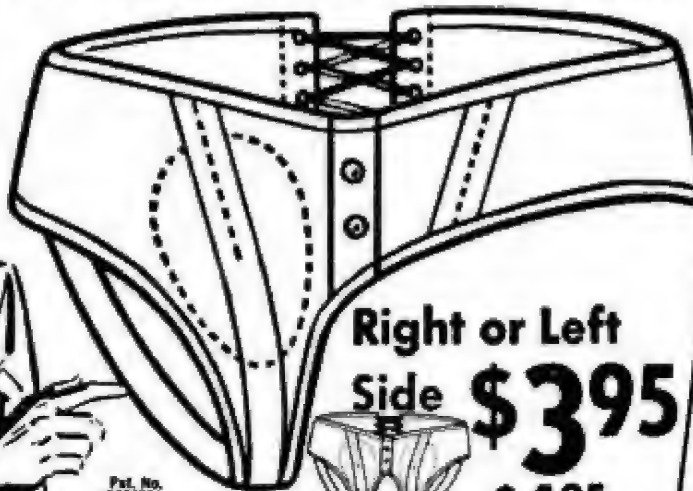
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LIQUID Rubber, make flexible molds. Free sample. Chaney, 1130 E. 16th St., Jacksonville 6, Fla.

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START Your own business on shoestring, and earn a substantial income by mail, in your spare time at home. Full details free. Standout Products, 141-T North LaBrea, Los Angeles 36, California.

SPECIALIZED Magazines help you to greater success. Latest copies of business, trade, professional, educational, sport, hobby, baking, chemistry, dairying, electrical, food, garden, horticulture, insurance, juvenile, lumber, medical, novelties, optical, pets, real estate, selling, travel and others covering all interests. List free. Commercial Engraving Publishing Company, 34C North Ritter, Indianapolis 19, Indiana.

RAISE Earthworms: Easy, profitable. Free literature. Earthworm Gardens, Dept. G, 224 W. Valley, El Monte, Calif.

GREATER Profits! Gifts by mail. Complete service. Western Activities, 1617 Hoover, Los Angeles 6.

SELL Books, plans, folios, mailorder. Huge profits. Wholesale catalog 10c. Man, 17 William, Hillsdale, New Jersey.

PIX Typewriters. Free booklet describes our modern, inexpensive home-study course. Factory methods taught. Write Typewriter, Building 1, Tarentum, Penna.

MONEY in new greaseless doughnuts. Start in kitchen. No smoke. Sell stores. Free recipes. M. Ray Company, 3605 South 15th Ave., Minneapolis 7, Minn.

MAKE \$8.73 Every time you sell one—And they're amazingly easy to sell! We have new adding machines in original factory cartons you can sell for only \$14.95 and you make 45%. They're executive model portables, precision built with automatic clearance, direct subtraction, fully guaranteed. Send for life size color photo with full details. Write today to Lightning Adding Machine Co., Inc., Dept. P-31, 1260 West Second Street, Los Angeles 36, Calif.

WANTED! Home producers, by manufacturers in our clearing house service. Become a sub-contractor, casting plastic products for these companies. Thousands of easy-to-make items required for consumer and industrial use. Cash in at home, without previous experience. Write Plastic Service Associates, Dept. PM7, East Boston 28, Mass.

NATURAL Molding rubber. Free sample. Flock, tinsel, supplies. W. Wooley, 115-A Donald, Peoria, Ill.

LYCOPodium Titivates dodads on whatnot shelves. All colors. Fascinating dyeing and Christmas wreath course. Enclose 25c for sample corsage. Lycopodium Foundation, St. Paul 13, Minn.

GREAT Opportunity to secure exclusive territories for sale of Peppo Ring-Seal, seals worn pistons, cylinders, stops oil waste. Every service station and automobile owner a prospect. Send \$5.00 for two samples, sell them for \$8.90 or return for money refund. Write Peppo, 117 Arch Street, Philadelphia 6, Penna.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 627-PM Linden, Buffalo, N. Y.

FREE Booklet reveals amazing secrets behind 301 new profitable enterprises! Many mailorder! Includes confidential instructions for starting wholesale buying service. Deumant Business Surveys, 79-PM Deumant, Kenmore 23, N. Y.

WE Love our mailman—He leaves over \$1000 monthly in our rural mailbox. My college professor husband drafted a scientific plan for a home mail-order business. It pays. We bought a Texas ranch, live as we always wanted to. Now we sell the "Ranch Mail Order Method." Write: Eveningshade Ranch, Relotes 3, Texas.

NEWEST Spare, full-time home business. \$5 to \$10 hour possible. Paint with suede—The finish with touch and eye-appeal. Beautify auto dashboards, signs, radios, toys, figurines, lamps—1001 others. Complete, step-by-step instructions sent for no-risk examination. Free details. Coast, 1004-HS So. Los Angeles St., Los Angeles 15.

MAKE Perfume. Catalogue free. International, 6347 Parnell-PM-7, Chicago 21, Illinois.

MAKE Products—Sell mailorder formula catalogue free. Inesco, 6347 Parnell-PM-7, Chicago 21, Illinois.

IMPORT-Export! Opportunity, profitable, world-wide, mail-order business from home, without capital; or travel abroad. Established World Trader ships instructions for no-risk examination. Experience unnecessary. Free details. Mellinger 27, Los Angeles 24.

START Your own business on credit. Your own boss. 1586 of our dealers sold \$5,000 to \$27,500 in 1951. We supply stocks, equipment on credit. 200 home necessities. Sales experience unnecessary. Pleasant, profitable business backed by world-wide industry. Write Rawleigh's, Dept. G-U-PPM, Freeport, Ill.

ADVERTISING Book matches—Cash in on big demand; sell union label matches. Cuts for all businesses and political parties. Free powerhouse selling kit, low prices, protection guaranteed on repeat orders. Cash commissions. Superior Match Co., Dept. MX-753, 7530 Greenwood, Chicago.

LEARN Sewing machine repair, electrify, rent, trade, sell. Make up to \$150 week spare time setup. Motor kits, zigzag machines, etc. wholesale. Free particulars. Taylor Service, Hamilton PM-7, Ohio.

FLEXIBLE Rubber moulds for plaster and Marbleite figurines. Sample and large illustrated catalog 25c, refunded on first order. K-C Novelties, Dept. 53, Easthampton, Mass.

HAVE Your own profitable business manufacturing and rebuilding batteries. Complete equipment. New and used. Bargains. Bowers Battery and Spark Plug Co., Box 1262, Reading, Penna.

\$50 AN Hour. Unusual spare time, home business. Johnson, 351-B, Ithaca, N. Y.

50 PLANS For home mail business. Proven money-makers. Personal help assures success. Verdo, Box 37-A, Huntsville, Mo.

OPERATE Escalator mailorder system, selling our products or any products. Fastest, most revolutionary mailorder system known. Write: Selbyco, Decatur 158, Ill.

GAIN Financial independence fitting watch crystals. Splendid home business. Details free. Crystal Shop, 814 Main, Lewiston, Idaho.

SUCCESS? Profits? Mail order enterprises for aspiring inventors, writers, everyone. Literature free. Jones Agency, 411 W. Fulton, Grand Rapids, Mich.

POPCORN And potato chip equipment. Long Eakins Company, 5360 High, Springfield 99, Ohio.

BOOKKEEPERS. Keep books, small firms spare time. Manual latest technique by C.P.A., \$3.00. Modern Business, Box 406, Youngstown 1, Ohio.

RAISE Orchids at home. Big profits—Fascinating. Year 'round any climate. No greenhouse. Instructions, including 3 orchid plants, sent for no-risk examination. Free details. Flowerland, 601-BN S. Vermont, Los Angeles 5.

STAMINITE Offers you a lifetime money-making opportunity selling newest, greatest discovery of world-famous chemical corporation converted into products used by every householder, hobbyist; industrial, institutional and commercial establishment in U.S.A. Earnings limited only by your initiative and sales ability. Don't miss this opportunity! It's the biggest news in a giant, basic industry. For details write Staminite Corp., Dept. P-3, New Haven 11, Conn.

EARN \$2.00 Hour! I do—Making sandals. Youngs, 1308-PM, South First, Arcadia, California.

EARN Money with typewriter, sewing machine! Details free. Edwards, 3915-PM, 12th, Des Moines 13, Iowa.

LET Others sell for you. Earn steady from home. No mail order. Full set-up service from idea to success. Free information. Hermes Company, 152 West 42 Street, New York.

PROFIT With garden golf. Instructions on locating, building, operating. Write. Brockway, Seaside, Oregon.

MAKE Tough, durable plastic—1c pound. Makes attractive floors, walls, built-ins, roof. Build good home \$150 room. Bays Laboratory, Oklahoma City 9.

START Home mail order business. Amazing plans. Literature for stamp. Lowell P. Amos, 2505 Vermont, Toledo 10, Ohio.

ELECTRO Plate for big profits with famous Easyplate process. \$3.50 buys complete outfit. Box 293-O, Red Lion, Penna.

SELL Popular Mechanics and all other magazine subscriptions. Free catalog, supplies. Subscription Service Company, Dept. A, P.O. Box 2070, Birmingham, Alabama.

MAKE \$1000 Monthly as easy as rolling off a log. Face concrete blocks in your back yard, apply stone siding in real stone color, design. Only \$8.00 per square. Greatly in demand by builders, contractors. Deposit for equipment \$300. American Natura-Stone Co., 2407 Garrison Blvd., Baltimore, Md.

BE Your own boss. We need distributors to place best ever concrete waterproofing through stores and direct to user. Excellent profits and continuing business. Rex Aquadry, 5511 W. North Ave., Chicago 39, Ill.

START A lettershop on a shoestring! Sales \$56,000. Started \$36.00. Information? Merritt, Box 13, Basking Ridge, N. J.

ARE You tired working for someone else? Be your own boss in good paying mail order business. Complete success details sent \$1.00. Kayel Sales, Box 1380, Milwaukee 1, Wisconsin.

HOME Mail business is your opportunity. Start small-build. Learn how from experts. Write: Fern, 513A W. 61st, Chicago 21.

TIN Cans. Turn them into cash. Nine methods. Instructions 50c. Charles Company, 12-DBF, Norwood, Ohio.

RAISE Mink; easy; profitable. Free information. Voight Farms, Atlanta 20, Texas.

ENORMOUS Texas pine cones. Red, gold, green, silver. Beauties to behold. \$1 brings two glittering samples. Agents wanted everywhere. E. L. Overstreet, Route 3, Lufkin, Texas.

START Your own thrilling mail-order business, on small capital; brand new plan. Write Paragon, Box PM-2194, Houston 1, Texas.

LAWN Soil analysis—Profits from your neighbors' lawns. Write Soiltest, 307P Woodland, Lake Bluff, Ill.

SELL Printing by mail! We fill orders. Free plans, samples. Sutton Printing, Box 853-G, Waycross, Georgia.

FRANCHISES Make amazing profits! Secure exclusive distributorship or agency operation for yourself. Nationwide opportunities. Free details. National Franchise Reports, 452 Pure Oil Building, Chicago 1, Ill.; nois.

FOR Pleasure or profit. Send for free illustrated business plan and instruction book; permanize, ceramize, porcelainize, metalize baby-shoes, hundreds of keep-sake items. No equipment, no firing, no baking. Jay Sales, 192 N. Clark, Dept. M, Chicago, Ill.

PRINT Without printing press—Posters, banners, greeting cards, toys, glassware, neckties—anything! New easy revolutionary method. No special equipment or experience needed. Work full or spare time at home. No selling. We set up your own local business. Wonderful money-making opportunity. Free sample. Profitable ideas, beautifully illustrated plan free. Write Screen-Print, 1610 South Los Angeles Street, Los Angeles 15.

MONEYMAKING OPPORTUNITIES

SELL By mail, Chamberlain Books, 37 Arizona Place, Chandler, Arizona.

WIN Contest money. General Contest Bulletin gives hundreds of tips. Lists current contests and rules. Sample 25c. General Contests, 1609½ East 5th, Duluth, Minnesota.

TIE-Breaker picture puzzles exposed. \$5.00. Wenograd, Box 1495, Philadelphia 5, Penna.

SELL Hydrocaps increases battery life 25%. Good profit, every car owner buys, real spare time money maker. Write for details today. Aviaparts, Box 884, Coral Gables, Fla.

400 RADIO Stations active. Free radio advertising. Pay commission only on orders received. Free information. Mishek, 2, Waseca, Minn.

INSTALL Hand railings on stairs, terraces, porches. Unlimited applications. Provides safety. Cast aluminum universal joints lock with set screws. 1 1/2 inch aluminum tubing will not rust. Easy to assemble. Fits any angle or grade. Install in wood, stone, ground or concrete. Profitable. Send for folder. Kloppenborg Aluminum Foundry, Dept. PMC-3, Davenport, Iowa.

SELL Titania gems; \$9.75 carat wholesale. More brilliant than diamonds. Free catalogue. Diamondite, 1404-M Mitchell, Oakland 1, California.

50,000 ARTICLES Wholesale. Source directory dime. Nelko, Box 3462-DR, Chicago 34.

PUBLISH Your own magazine. Hand-some 52 page format, well edited, illustrated. Cost low as \$1.00 month. Brings you prestige, profits. 25c brings sample, details. National, Ord, Nebr.

137 PLANS To make money, local mail-order. Details: Elite Co., 220 Grand St., New York 13.

READ Progressive Mailtrade, the magazine that tells how to make money by mail. Dime brings sample and special offer. Progressive Mailtrade, Box 357, Sheboygan, Wisconsin.

FREE Book "505 Odd, Successful Businesses." Work home. Expect something odd! Pacific, Oceanide, Calif.

SPARETIME Profits taking subscriptions, all magazines. Wholesale catalog free. Cassell Agency, Westfield 2, New Jersey.

\$5.00 PER Hour assembling driftwood lamps. Sam Patchett, 2187 N.W. 24 Court, Miami, Florida.

EARN Money evenings, copying and duplicating comic cartoons for advertisers. Adservice, Argyle 1, Wisconsin.

FREE! Your mailorder business! Everything furnished! No investment! Terrific profits! Write today. California Vitamins, 2908PM Beverly Blvd., Los Angeles 57, California.

CEYLON Gems, beautiful, sell at sight, experience unnecessary. Begin with profitable \$12 parcel airmailed. John Rajapakse, Negombo, Ceylon.

WHOLESALE \$750,000 Items. Lists free. Putney, 181-M West 62nd, New York 23.

START A buying service, buy wholesale thousands nationally advertised products. Make big profits selling at sizable discounts. Postcard brings details. American Buyers, 630-PM Linden, Buffalo, N. Y.

FREE Booklet reveals amazing secrets behind 301 new profitable enterprises! Many mailorder! Includes confidential instructions for starting wholesale buying service. Deumant Business Surveys, 83-PM Deumant, Kenmore 23, N. Y.

ASSEMBLE Electric fans. Exhaust and circulating for home, attic, kitchens, restaurants, offices, factories. Sells easily. We furnish all fan parts including electric motors. Send for wholesale parts catalog. Kloppenborg Aluminum Foundry, Dept. PMC-3, Davenport, Iowa.

BE Independent, be secure, have your own profitable business—Earn \$20.00 and more a day making beautiful, fast-selling lamps at home. No equipment needed. Illustrated course teaches you quickly. Course, parts catalog, wholesale price list—only \$2. Gearon Co., Dept. 200-B-7, 27 S. Desplaines, Chicago 6, Ill.

\$10,800 PROFITS! Your own mailorder business! No capital risk! Success plan (worth \$2) free! Write today! Treasury, 709 Webster, New Rochelle PM-13, New York.

\$100-\$200 WEEKENDS. No manufacturing, no selling, experience unnecessary. Virillo, Box 507-Z, North Hollywood, Calif.

EXQUISITE French imported costume jewelry. Big profits on re-sale. Free catalogue. Florence Jewelry Co., P.O. Box 296, Mineola, N. Y.

PROFITABLE Home business. Particulars free. Jeanne Gilbert Cosmetics, 113 West B St., Ontario, California.

BE Notary public. Rate higher. Details free. Stationers, Helotes, Texas.

MAKE To \$4.50 hour doing common pen lettering. National Artists, 801 1/2-A North Marshall, Dallas 3, Texas.

EUREKA! Goldfoil! Big profit possibilities! Sample 25c, Arndt, (PM7) 1017 Bay, Eureka, Calif.

500,000 ITEMS Wholesale! Sources, plans, formulas, tips in big profitmaker folio, 25c. United, Box 67-M, Detroit 2.

BIG Money in plastics, no investment! Sell at discount from free colored illustrated catalog 's friends, neighbors and customers. Over 350 nationally famous plastic household items, toys, novelties. Write now. Free catalog. House of Plastics, 6222 North Capitol Street, Washington 11, D. C.

SAMPLES, Mailorder specialties, mail-order magazines, plans 25c, refunded. Vibra-Whirl Manufacturing Co., 6006 Floyd, Houston 7, Texas.

OWN Collection agency—Pays big. Hundreds who took our home study course now have their own office. Free booklet. Franklin Credit, Roanoke 7, Va.

FUTURE Security! Learn watch-clock repairing at home. Free information. Modern Technical Supply Co., 55 PM West 42nd Street, New York 36.

SELLING Plans and information. Alan Sales, Box 15, Glen Ellyn, Ill.

FORMULAS, PLANS, ETC.

MILLER'S Modern manufacturing formulas make fast-selling products that get the business and pay. Fifty years supplying the best. Late literature free! Miller, Consulting Chemist, Tampa, Florida.

REAL Manufacturing formulas. Lists free. Cummings, Chemist, Gordon Ave., Syracuse 4, N. Y.

FORMULAS: All kinds. Latest, best. Literature free. Kemzal, Park Ridge, Ill.

FREE Formula catalog. Anything analyzed \$35. Western Chemical, Salem, Ore.

ANY Formula \$3.00. Chemical Instruction Sheet—catalog 10c. J. Belfort, 216 W. Jackson, Chicago 6.

LIFETIME Business! Manufacture extremely profitable chemical products! Descriptive information free! Thermolab, Peoria 4, Ill.

PRODUCT Analysis, manufacturing formulas, processes developed. Moderate fees. Plastics, Box 1574, Boston 4, Mass.

PLASTICS

LUCITE, Plexiglas. Any size sheets, masked. Square foot (12 x 12) cost, 1/16", \$1.30; 1/8", \$1.40; 3/16", \$1.75; 1/4", \$2.08. Include 10% postage. Almac Plastics, 600 Broadway, New York City.

PLASTIC, Sheets, rods, tubes, etc. Free list. Plastic Supply Co., 2901 N. Grand Blvd., St. Louis 7, Mo.

PLASTICS Home-craft course for men and women. Tells and shows how to make hundreds of fast selling plastics products. All plastics and materials for 23 projects included in course. No special tools needed. Course pays for itself. Write for free booklet. Interstate Training Service, Dept. D30, Portland 13, Oregon.

PLASTICS—Lucite, Plexiglas, Acetate, Vinylite, Polyester-Fiberglass. Low, low prices. Value-packed, bargain-filled catalog 10c. Airmailed 25c. Gem-O-Life, Box 6884P, North Hollywood, California.

SPECIAL Plastic for laminating photos, cards, etc. Send for prices. Solomon, 46 Cornhill, Boston 8, Mass.

PLEXIGLAS Sheets cut any size. Edins Service Specialties, Abilene, Texas.

NEW Liquid casting plastic. Clear, colors. Embed flowers, insects, coins. Saw, drill, carve. Send 25c for Castolite Creations Manual and proved success plan showing how to make money at home. Castolite, Dept. H-101, Woodstock, Ill.

CHEMISTRY

SPECTROSCOPE For quick chemical analysis \$3.00. Book 200 electric stunts \$1.00. Kutting Sons, Los Altos, Calif.

NEW Idea chemical and apparatus outfits for home experimenting. Photo-scales, microscopes, chemicals, biological and laboratory supplies in small quantities. Catalog 25c. Established 1931. John H. Winn, 124A West 23rd Street, New York, N. Y.

ILLUSTRATED Catalog: Chemistry, mineralogy, biology. 10c. Tracey Laboratories, Evanston, Illinois.

CHEMICALS And apparatus for industrial, analytical, and private laboratories. Catalog 25c. Dept. M-50, Biological Supply Co., 1176 Mt. Hope Ave., Rochester 20, N. Y.

MERCURY, While it lasts, 25 cents per ounce, postage included. Minimum two ounces. Nucleus Trading Co., 1558 Minford Place, New York City 60.

IMPROVED Second printing, spectacular chemical fireworks experiments manual. Not mimeographed sheets. Contains complete formulas, set-ups, instructions on thermites, fulminates, explosive powders, etc. Still \$1.00 postpaid. Free details. Chemi-Tech Laboratories, 5880C Riley, Buffalo 8, New York.

AMAZING New book of science. Experiments, formulas and catalogue of laboratory supplies. Only 25c. National Scientific Co., Dept. 16, 2204 W. North Ave., Chicago 47, Illinois.

AGENTS WANTED

GOLD, Silver lacquered letters. Windows, doors, trucks. Standard sizes. Penny and up. Big profits. Samples, Atlas-D, 544 West 19th, Chicago 20.

500% PROFIT Selling multicolor, ready-made cardboard signs for every business. Dynamic samples and catalog, 25c. M. Velvetex, 200 W. 34 St., New York 1.

CLARESA Chrome polish cleans and sells in a hurry. Claresa Chemical Co., Irwin, Penna.

MEXICAN Feather pictures. Sell on sight, 200% profit! Free details. Sample 20c stamps. (No coins). Syvilap, Apartado 9036, Mexico City.

SELL Big money maker to men and women. Easy handwork makes fast-selling useful articles. Sample free. Sunmade Company, Brockton 64, Massachusetts.

STYLISH, Cheap. Sensational plan, stamp. Spectacles, 112 Adams, Hoboken 8, New Jersey.

MAKE Extra money. Sell front door name plates to friends, neighbors. Retail \$1.98; you make \$1.00! Free selling kit. Modern Engraving Co., P.O. Box 194, Boston 14, Mass.

ABSOLUTELY Free—Sales kit. Yours for the asking. Send postcard today requesting kit showing new line, belt buckles with your name or personal initials, cap badges, choice 3000 different emblems. Write Hook-Fast, Box 1425PM, Providence, R. I.

CALIFORNIA Sweet smelling beads. Sensational sellers. Free particulars. Mission, 2328PM West Pico, Los Angeles 6, Calif.

YOUR Own business—Used suits \$1.50, overcoats 65c, mackinaws 35c, shoes 12 1/2c, ladies coats 30c, dresses 15c. Enormous profits. Catalog free. Moro, 558-AA Roosevelt, Chicago 7.

AGENTS: Stamping names on key protectors. Sample 25c. Stamping outfits, checks, social security and name plates. Hart Mfg. Co., 303 Degraw St., Brooklyn, N. Y.

AGENTS—300% Profit selling genuine gold window letters; stores and offices. Free samples. Metallic Sign Letter Co., 431-D North Clark, Chicago.

EXCELLENT Sideline for printing and advertising salesmen. Decalcomania name plates in small quantities. Great demand. Also, make money with our line of automobile initials and sign letters. Free samples. "Ralco" XL-Roxbury, Boston 19, Mass.

BE A money maker. Use your home as magazine headquarters. Liberal commissions. No experience. No capital needed. Everything furnished. Write for free catalog. McGregor Magazine Agency, Dept. 500A, Mount Morris, Ill.

PRINTING, Salesbooks, envelopes. Free illustrated catalog. Erco, Dept. PM, Bronx 72, New York.

\$50 WEEKLY Selling finest razor blades, other items. Free details. Edisons, Box 274, Far Rockaway, N. Y.

SELL Harmar's French fried popcorn to stores and taverns. Fast repeater. Harmar Products Co., Hammondsport, N. Y.

MAKE Extra money for yourself, club or church. Up to 100% profit selling Christmas, all-occasion greeting card assortments to friends, others. Leading 21 card \$1.00 boxes, religious and novel cards, gift wrappings, ribbons, stationery, animated books, unusual gift items. Deluxe imprinted personal Christmas cards. Experience unnecessary. Write for samples on approval, special offers, extra 5% bonus plan. Hedenkamp, 361 Broadway, Dept. PM-38, New York.

MAKE Money introducing world's cutest children's dresses. Big selection adorable styles. Low prices. Complete display free. Rush name. Harford, Dept. K-1341, Cincinnati 25, Ohio.

BRAND New! Amazingly different and smart Christmas cards bring you big money! Take easy orders fast! Pays up to 100% cash profit. With name 50 for \$1.50. Big line. Sensational Glo-in-the-Dark ornaments, personalized stationery, matches. Several \$1.00 boxes on approval. Imprints free. North Star, 31 Glenwood, Dept. 18-K, Minneapolis, Minn.

MONEY For Xmas. Make at least \$50 showing beautiful Elmira Christmas and all-occasion greeting card assortments—Name imprinted Christmas cards, stationery, napkins, book matches, playing cards, gift wraps, books, games, household, hostess items. All unbeatable values. Make money while you make friends. No experience necessary. No risk. Send no money. Free samples, catalog. Bonus plan, display assortments on approval. Write today! Elmira Greeting Card Co., Dept. C-173, Elmira, N. Y.

NEW Bathroom deodorizer. Hangs on wall. Banishes odors bathroom, kitchen. Lightning seller. Samples sent on trial. Kristee 122, Akron, Ohio.

SHINE Shoes without polish. New invention. Lightning seller. Shoes gleam like mirror. Samples sent on trial. Kristee 121, Akron, Ohio.

DROP Everything! Sensational earnings now to Christmas with fastest-selling, popular-priced personal Christmas cards, name-imprinted. Also album of deluxe designs. Box assortments too. Send name for samples. Wallace Brown, 225 Fifth Ave., Dept. D-4, New York 10, N. Y.

RUN A spare-time greeting card and gift shop at home. Show friends samples of our new 1953 Christmas and all-occasion greeting cards. Take their orders and earn up to 100% profit. No experience necessary. Costs nothing to try. Write today for samples on approval. Regal Greetings, Dept. 27, Ferndale, Michigan.

SELL Beautiful chenille flowers and novelties. Catalogue free. Midwest Supply Co., Box 2193, Casper, Wyoming.

JUST Out! New thrilling sensation in Christmas cards. Make big money! Show luster foils, satins, brilliants. Amazing values bring easy orders! Magic Glo-in-the-Dark ornaments, personalized stationery, matches. 30 free samples. With name 50 for \$1.50. Several \$1.00 boxes on approval. Joy greetings, 507 N. Cardinal, Dept. 60-K, St. Louis, Mo.

1953 WHOLESALE Dealer kit on appliances, typewriters, recorders, cameras, giftware, lighting fixtures. Free. Write Arrow Distributing, 154K, Nassau St., New York City.

BUY Wholesale thousands nationally advertised products at big discount. Free wholesale plan. American Buyers, 629-PM Linden, Buffalo, N. Y.

AMAZING Profits selling exclusive Sunshine Christmas cards: Nature prints, scripture text, imprints, nationally famous. 21 for \$1.00 assortments all sell on sight! Many others! Also gift wraps, stationery, etc. Send for samples on approval. Sunshine Art Studios, Inc., Dept. PM-7, Springfield 1, Mass.; Pasadena 3, California. (Note: East of Rockies address Springfield office.)

MAKE Money selling ties. Buy direct from manufacturer. Write to Philip's Neckwear, 20 West 22nd, Dept. 147, New York.

MAKE More profits, buy nylon hosiery. Low wholesale prices. Sample dozen pair popular colors, sizes \$7.95 or write for confidential price list on quantity purchases. Stewart Distributing Company, Dept. PM1, 2502-4 East Fifth, Tulsa, Okla.

FOR Opportunity of lifetime see Stamp-inite advt. Business Opportunities column.

MAKE \$50, \$75, \$100. More! Sell new, different Christmas, all occasion greeting cards. Big profits. New bonus reward. Experience unnecessary. Write for feature samples on approval, free samples name imprinted Christmas cards, exclusive stationery, free color illustrated catalog, selling guide. New England Art Publishers, North Abington 733-C, Mass.

MEXICAN Feather pictures. High profit! Fast sellers! Adelphi, Box 57-B, Bellerose 26, N. Y.

HOME Agents. Power lawn mowers. Red hot Special. Rotacut-PM, Excelsior Springs, Mo.

RED Hot television unit. \$2.95 net. Or, write quick. Smith Agency-PMV, Excelsior Springs, Mo.

AGENTS-Salesmen: Sell beautiful hand colored plastic enlargements and sensational new personalized photo compacts, rings, bracelets, lockets, etc. Experience unnecessary. 40% advance commissions. We deliver, collect. Wonderful sideline—Better full time. Free sample outfit. Novel Portrait Co., 3343 North Ave., Chicago, Ill.

AGENTS Wanted to sell sensational new Insect-O-Lite that's taking country by storm. Insects by millions. Chemical vapors kill farm and domestic insects. Retailers for popular \$6.95, 100% profit each sale. Contact Dept. P7, Insect-O-Lite Co., 2904 Woodburn Ave., Cincinnati 8, Ohio.

150% PROFIT Demonstrating amazing new perfumed waterless hand cleaner. Write, Hill Sales Co., Waynesburg 8, Penna.

AT Last! Something new and sensational in Christmas cards. Make extra money fast! Show satins, velours, metallics. Gets easy orders. Pays up to 100% cash profit. 30 free samples. With name 50 for \$1.50. Big line. Amazing new Glo-in-the-Dark ornaments, personalized matches, stationery. Several \$1.00 boxes on approval. Puro Greetings, 2801 Locust, Dept. 340-J, St. Louis, Mo.

\$1.00 PROFIT Selling \$2.95 photo enlargement deal. Allen Studio, Riegler Bldg., Little Rock, Ark.

\$1 STARTS You in business. Sell ties. Send \$1 for 2 sample ties. Special doz. price, \$5.75, plus selling plan, wholesale order blanks. Radio City Neckwear, P.O. Box 25-MI, Sta. A, Flushing 58, N. Y.

AGENTS—Sell proven repeat materials, garages, body shops. Producers—Write, Automotive Specialty Products, Mt. Holly Springs, Pennsylvania.

FOUR Out of five buy immediately after your Blade Master demonstration giving you 100% profit. This magic black box puts an instant edge on any standard double-edge blade. Makes them better than new. Thirty, fifty, one hundred and more shaves from one blade. Send one dollar (no c.o.d.) refundable deposit for sample (only one to one salesman) with money-back guarantee within five days, with complete details, quantity prices and how to sell Blade Master best. Blade Master, Dept. 7, 315 East 91st Street, New York 28, N. Y.

AMERICA'S Newest sensation. Glowing nite signal mt. Needed by \$5 million auto, truck, bus, taxi drivers, motorcycle, bicycle riders. Fast sales. Big profits. Details free. Sample \$1.00 postpaid. Protection Industries, Box 385, Whittier, California.

DIRECT From manufacturers. Sell costume jewelry for extra money and high profits. Rhinestone and gold-plated sets, beautifully gift-boxed. Also, gift items and household appliances. Send for illustrated catalog! Packard Jewelry Co., 220 5th Avenue, New York, N. Y.

REAL Guaranteed deal! New! Will not be sold in stores. Small golden cake makes quart highest quality liquid detergent; case of 48 sells \$48.00. Costs you \$24.00 delivered. Quart at biggest chains and supermarkets costs housewife \$1.45 or more. Sample \$1.00 postpaid, credited on your first order. Write for folder 252. Clearsite Laboratories, Inc., 2 Logan St., Pittsburgh 19, Penna.

AMAZING Nylon stockings guaranteed to one year or replaced free if they run or snag! Complete line men's and children's hosiery also guaranteed one year or replaced free! Earn to \$3 an hour spare time. Pay nothing. Risk nothing. Just write orders. We deliver and collect. Advance cash plus huge 40% bonus. Watkins sent 92 orders one day. Armstrong earned \$202 in 9 days. Opportunity become manager appointing others. Rush postcard for free samples and money-making outfits. Kendex, Babylon 23, N. Y.

BALL Pens \$10.00 gross, d.e. s.e. blades \$4.20 M. assorted plastic aprons \$1.40 dozen up. Lutzker, 871 East 170th, New York City 59.

AGENTS! Demonstrators! Distributors! Up to 300% profit! Every car-owner, gas-station, store wants Dual Perma-Glaze. Produces glass-like finish. No-rubbing demonstration sells like wild. Nothing to it—It's concentrated. Everything furnished including your own printed labels. Send 50c (refundable) for sample can with complete details. Artix, Dept. P, 179 W. Washington, Chicago.

WHOLESALE Catalogue! Nationally advertised appliances, cameras, watches, etc. Cam Company, 1717PM—58th St., Brooklyn 4, N. Y.

SALESMEN—DISTRIBUTORS

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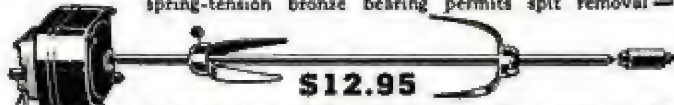
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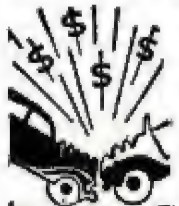
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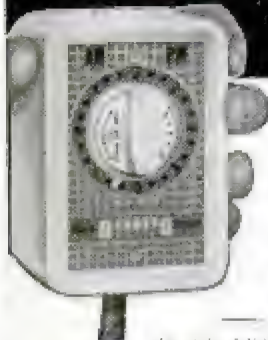
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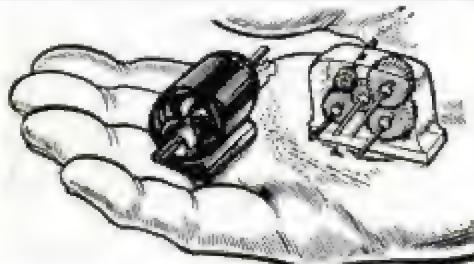
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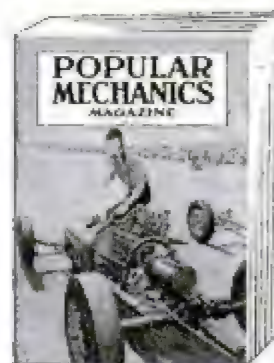
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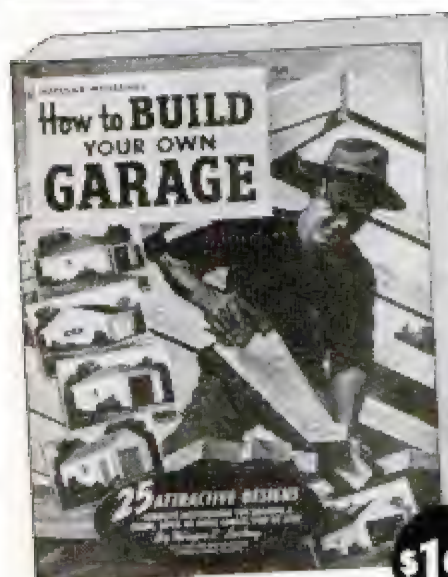
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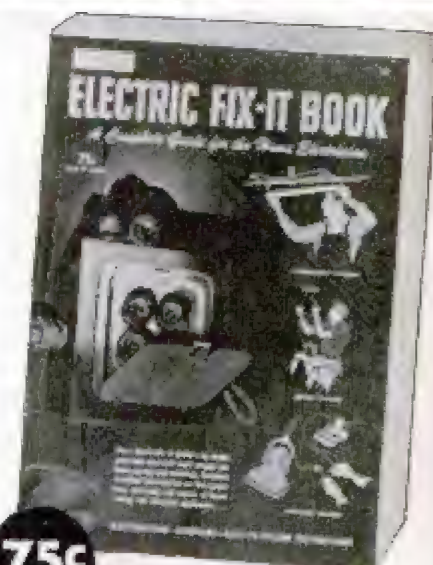
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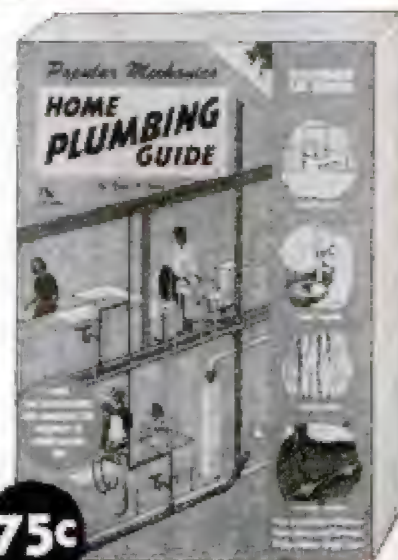
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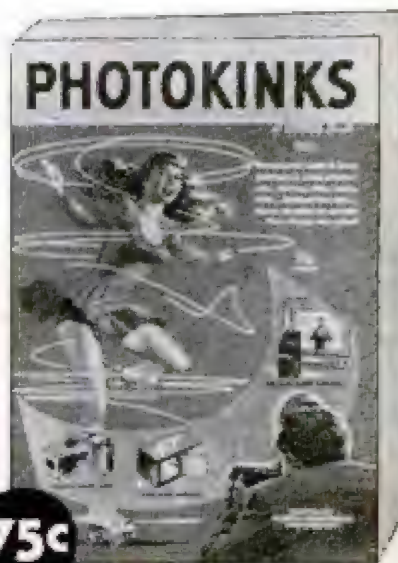
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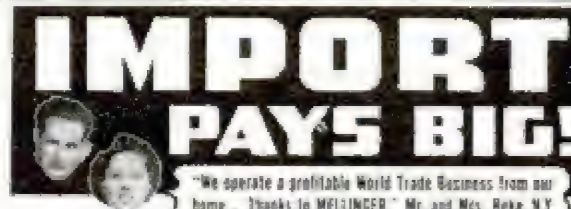
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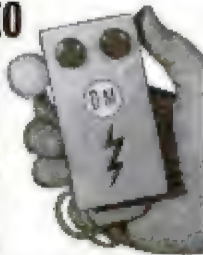
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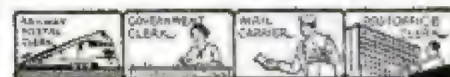


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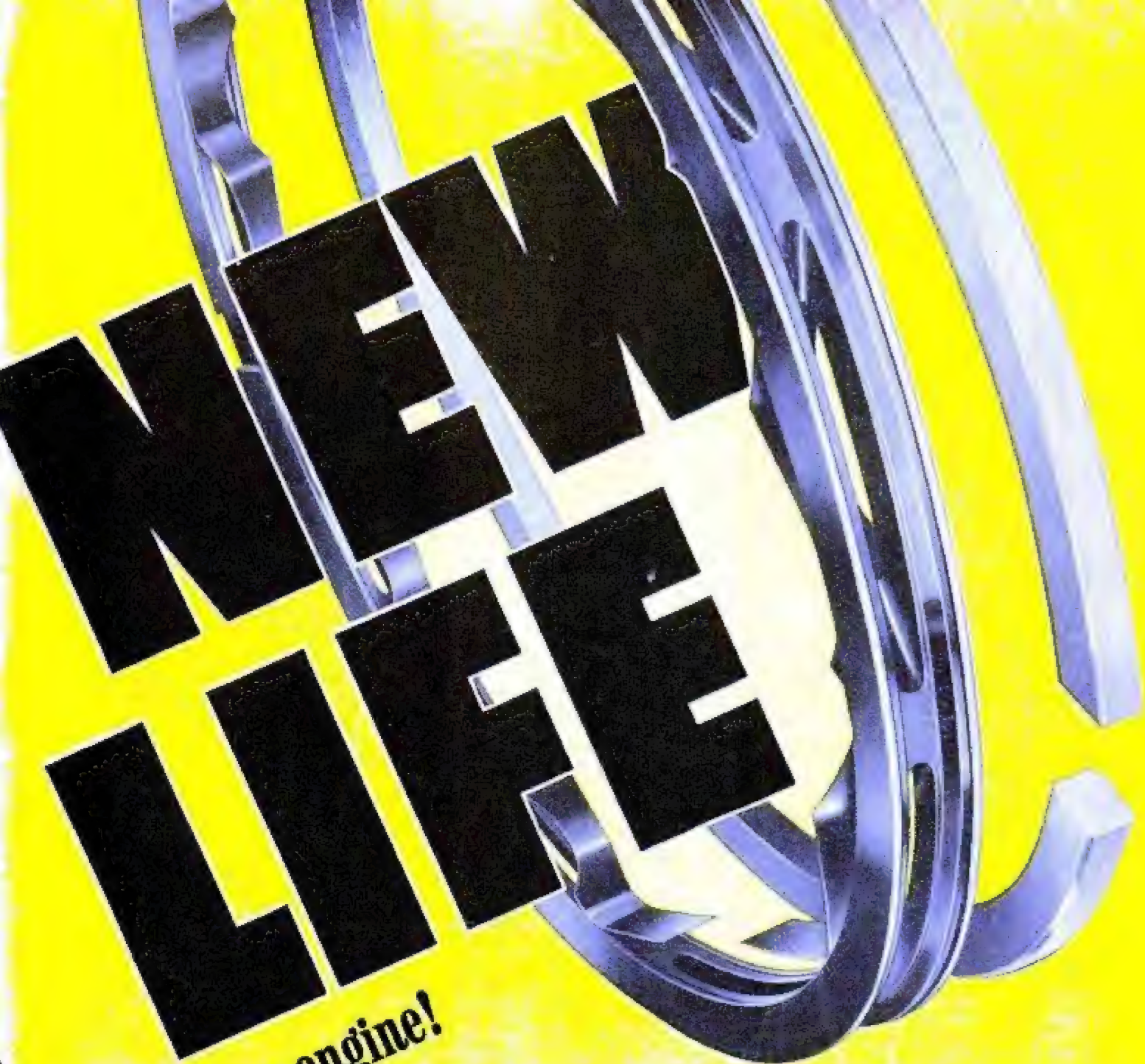
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POPULAR MECHANICS

JULY
1953

WRITTEN SO YOU CAN UNDERSTAND IT
VOL. 100 NO. 1

Murders are re-enacted in miniature in this college laboratory whose doctors make



These four-inch rifles are in one of the model murder scenes

Mysterious Death Their Business

By Richard F. Dempewolf

DEATH from causes unknown" is a phrase that will drop from its too frequent use in the nation's homicide files if a new kind of investigator has anything to say about it.

Today, on an upper floor in a remote wing of the Harvard Medical School, an eerie atmosphere hangs over a certain laboratory headed by pathologist Dr. Richard Ford. Called the Department of Legal Medicine, its business is concerned with unexplained death.

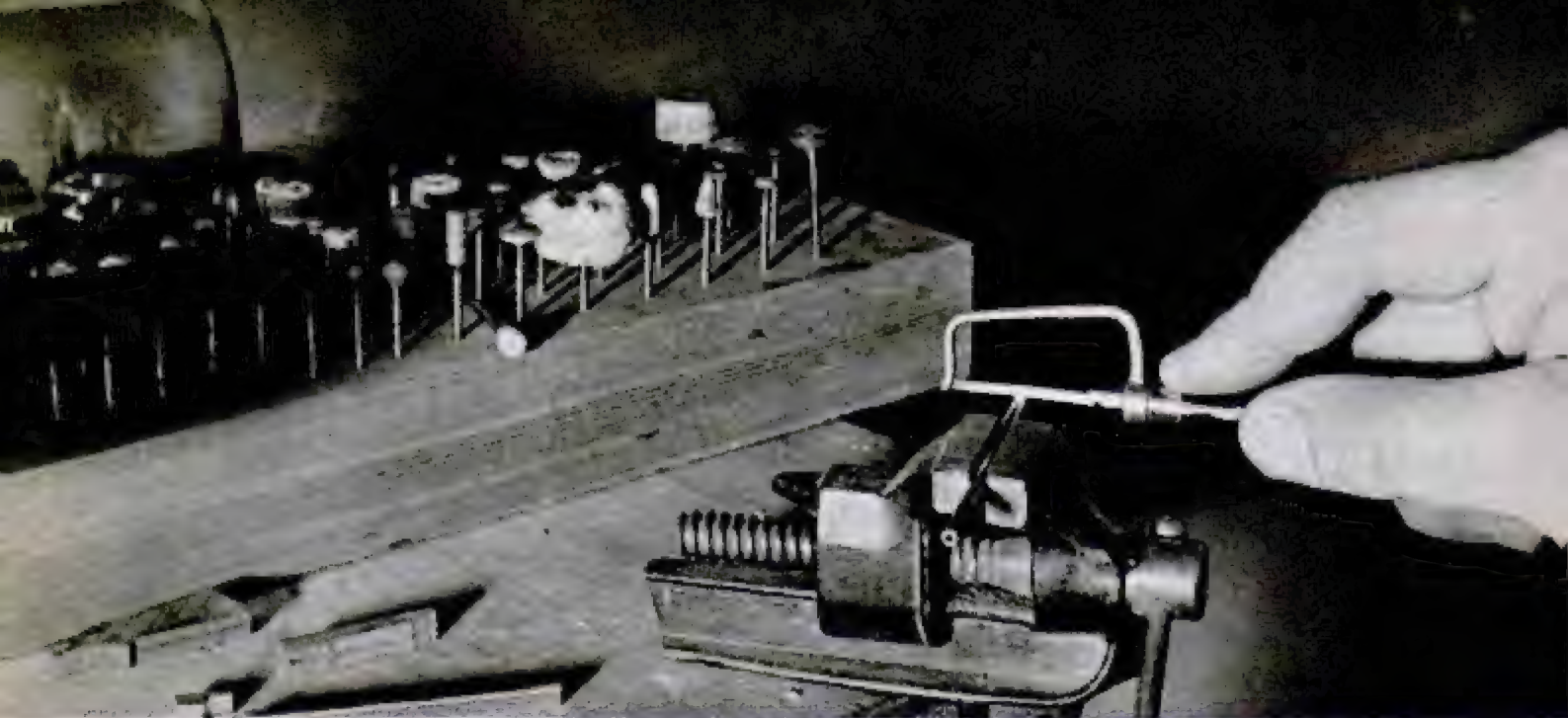
Sightless eyes stare at intruders from a row of life-sized plaster heads of murder victims—one with slashed throat, another with a bullet hole drilled through one

temple, trickling a painted red stream against its death-white cheek. Beneath them, rows of plaster chest sections are perforated with accurately simulated bullet holes and powder burns typical of wounds inflicted by various-caliber bullets at varying distances.

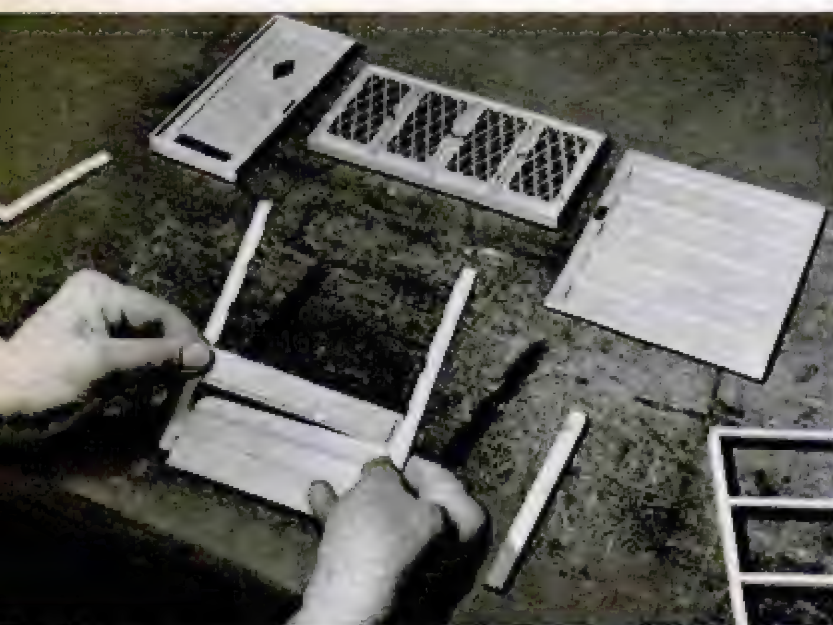
To the quiet whir of motors in another room, little cubes of tissue are being coated with paraffin in a complicated apparatus resembling a miniature merry-go-round. A precision knife cuts slices 1/10,000 inch thick from these wax-embedded bits, so they can be stained and viewed under a microscope. This seems pretty routine until Mr. Glass, the white-coated assistant to

In most miniature death-room settings at Harvard, an observant examiner can find a dozen or more good clues

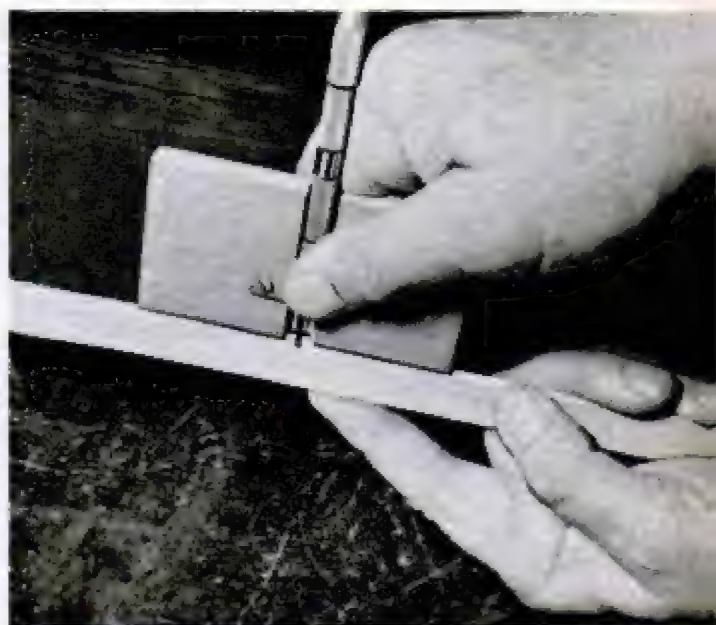




After brass tubing for a rifle barrel is cut with a tiny dental saw, bits at left will grind it into shape



Doors and window frames in model houses are made exactly as they would be for a full-size dwelling



Sliding gadget was specially built to hold a bit in place during cutting of a tiny baseboard molding



Postage-stamp-size shakes, split with a razorlike tool, are carefully nailed to a small wall section



It works, but this metal garage-door latch is so delicate that it has to be placed with tweezers



Most toy furniture is too crude for model use and is re-covered with material of scale weave and design

Doctor Ford, tells you the cubes of tissue are part of a man who was killed yesterday under suspicious circumstances.

A sample of his blood may be in one of the opaque jars in the refrigerator. His clothes are in another room, ready for a going-over by all sorts of instruments. The dust from his pockets is being collected grain by grain, not to mention the grit from his trouser cuffs, scrapings from his shoes, and microscopic bits of skin found under his fingernails.

Behind glass, recessed in the jet-black walls of another room, are 17 scenes of violent death in miniature. Here, a farmer

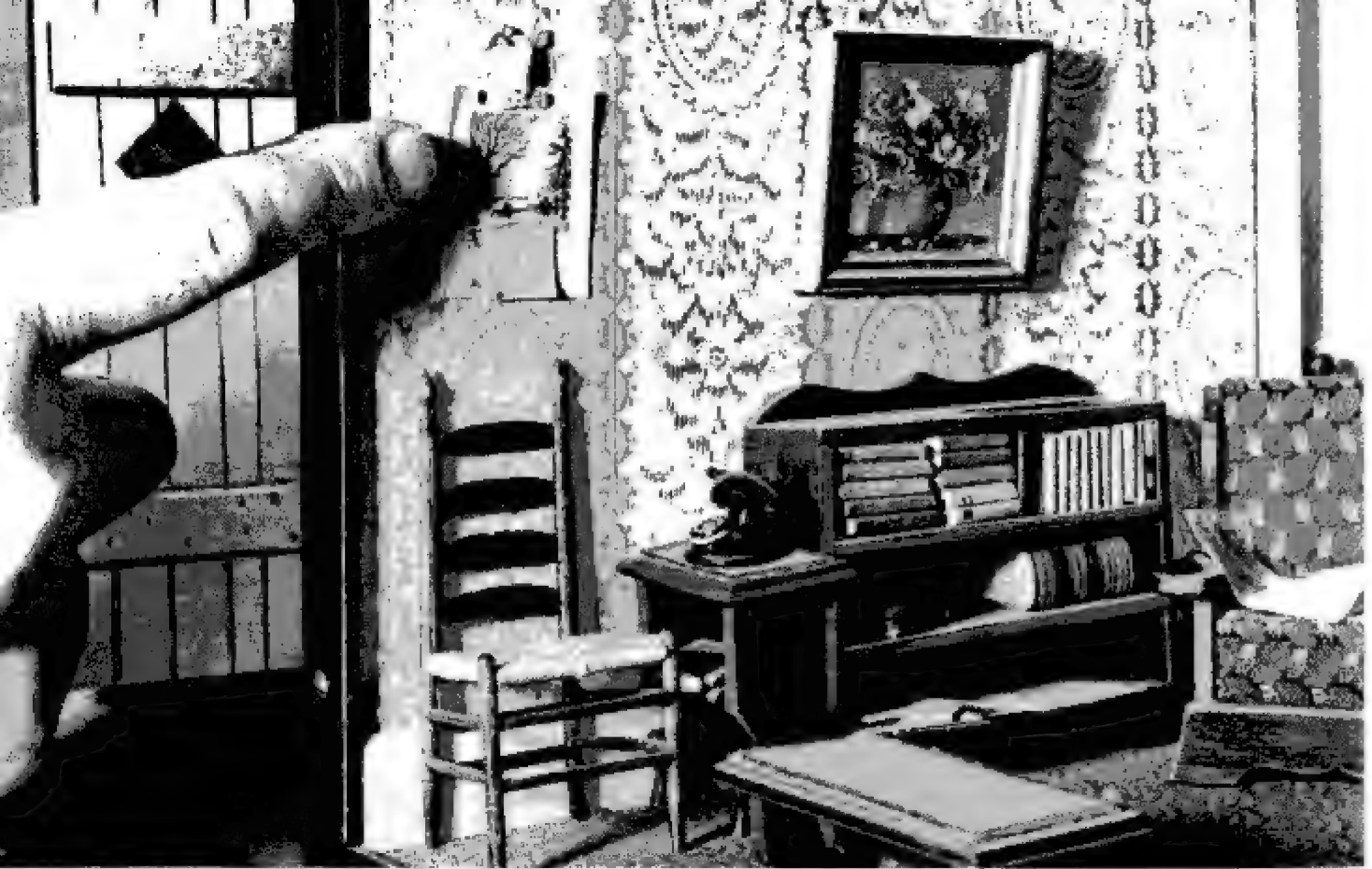
has hanged himself (or has he?) in a weathered old barn; there a trapper lies dead in a tiny cabin, fire glowing in the range, dishes and food lying scattered about. Someplace in each of these miniature sets, built one inch to the foot, a scientifically experienced eye will find clues to a heinous crime.

Today, in 38 states, legal-medicine men point out, the "experts" called in to evaluate medical and legal evidence in suspicious deaths are still usually coroners. Some are doctors, but most coroners need not know a clavicle from a clarinet to hold their jobs. They may be pubkeepers, shoe salesmen or

At the legal-medicine lab, skin and other tissue go into this machine for a series of paraffin coatings

Paraffin-coated skin, mounted on a button, is cut into 1/10,000-inch-thick slices for study on slides





As an example of infinitesimal detail, all the print on the calendar and newspaper on chair is readable

undertakers. This system, say legal medics, has led to many a miscarriage of justice and has often permitted murderers to get away unsuspected.

It was this fact that prompted Mrs. Frances Glessner Lee, a wealthy New Hampshire woman, to offer Harvard \$250,000 in 1939 to set up a unique department where genuine experts could be trained. Each year police, doctors, lawyers and newspapermen from New York to Honolulu swarm to its seminars. As a result, 10 states have thrown out their coroner system partly or entirely in the last few years in favor of a "medical examiner" system employing real experts. And the laboratory itself is continually called upon to help unsnarl tough cases.

"There are 2500 unexplained deaths in this state each year," Glass explains. "Here we investigate and perform autopsies on more than 500 of them." Often, by using skilled medical men and scientific methods, they have produced answers that have pointed to a killer, freed innocent men suspected of murder and solved deeply tangled mysteries.

Wandering through the microscopy lab, Glass describes how it works, punctuating his description by waving toward this machine or that, emphasizing his points with actual cases.

Say a man is found dead with a wound in his head. The pathologist on the case

sends samples of brain tissue for analysis. The doctor discovers a hemorrhage in the tissue, cuts out the section and puts it in formaldehyde. From there it goes to the tissue room where it's paraffined and sliced in a long, thin ribbon into a pan of water. Then it's picked out with tweezers, dropped on a slide and carefully guided through a series of stains. By its condition and color, expert pathologists can tell whether it is a new hemorrhage or an old one. Depending on what they find, someone may be cleared of a murder or manslaughter charge, or someone may be arrested for a serious crime.

Recently, the lab was called in on a case where a man had died after a fight with a friend. The friend, held on a manslaughter charge, claimed that his buddy had started the fight, was perfectly well after the brawl, but lay down to take a rest and never woke up. There were no witnesses. When the lab finished, Doctor Ford was able to testify that the victim had old brain lesions which would, indeed, have given him a crotchety disposition. Furthermore, the bruises he received in the fight had not been enough to cause death. He had succumbed to a stroke of apoplexy brought on by his own excitement. The prisoner went free.

Lack of careful, scientific probing can work the other way, too, Glass points out. Many a killer has gone completely

unsuspected because some examiner took things at face value. To show how it might happen, he tells about the farmer whose friends noticed his stock hadn't been fed, and went in the house to find him in bed, unconscious. The doctor was called, diagnosed it as stroke and sent him to the hospital. Twenty-four hours later, the farmer was dead.

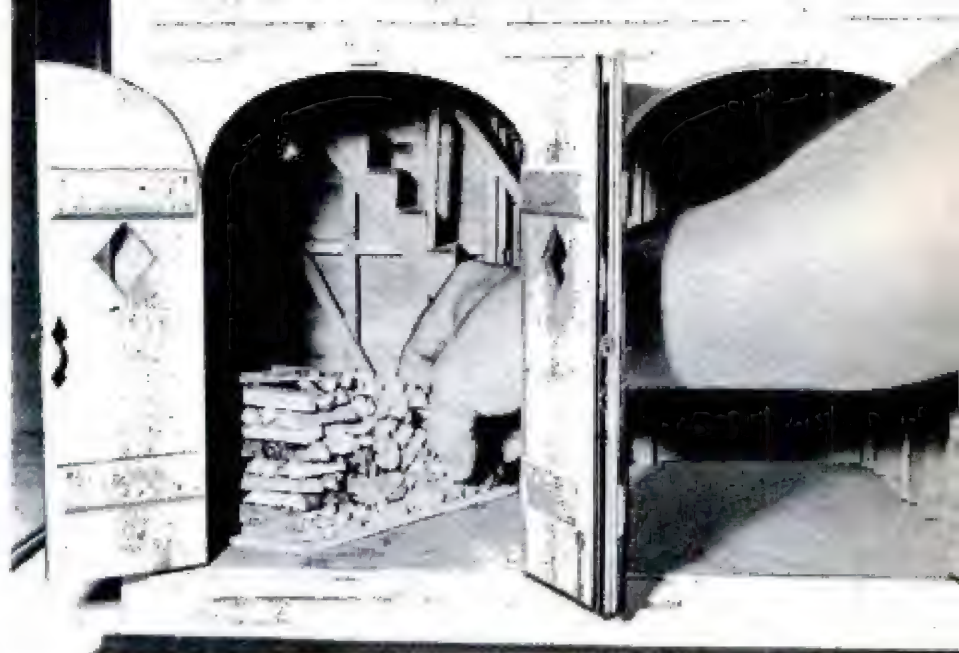
There was no question about the stroke—all the symptoms were there. But the coroner was a doctor and, since the farmer had no medical record of previous trouble, he ordered a genuine legal-medicine autopsy, just to make sure. The pathologist found the stroke evidence all right. But he found something else, too. A severe case of meningitis had caused death. And it had been brought on by way of a minute stab wound at the back of the head—through a hole so small that even the pathologist hadn't noticed it until the scalp was turned back.

Police reinvestigated and learned that during a rousing party at the dead farmer's house the previous week, one guest had stabbed him with an ice pick. Since the farmer was up and around several days afterward, no one thought he was hurt. The killer—entirely unsuspected until medical-legal science stepped into the picture—was arrested and convicted of unpremeditated murder.

Not long ago, someone found an entire skeleton under the floor of an old barn. It had been there two years, the examiner estimated—which fitted in with the time a man in the neighborhood had disappeared. A boy and a girl who had been known to dislike him for various reasons were arrested. Evidence seemed to show that both had threatened the man with guns, but that the girl had done the actual shooting and hidden the body.

At this point Doctor Ford was called. A careful examination of the skeleton with all the tools available at the legal-medicine lab turned up something that had been completely overlooked before: A tiny groove was neatly bored along the edge of one bone in the spine. Test bullets from each gun were matched to the

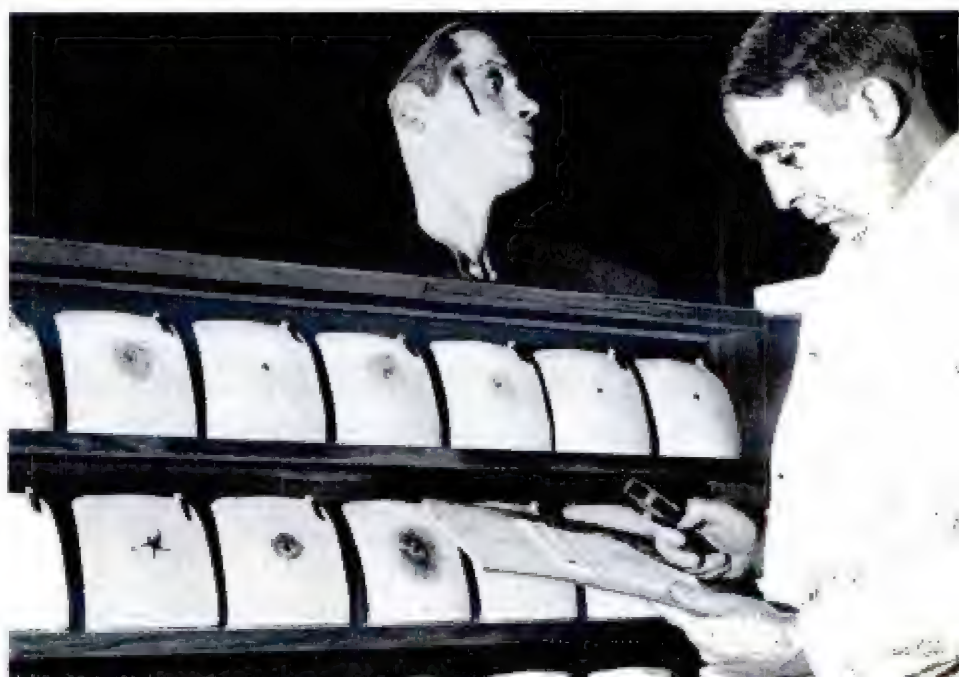
(Continued to page 234)



Even the woodpile for a miniature garage is realistic. Split twigs were glued and tacked together in a natural-looking pile



False identification can waste valuable investigation time. They look alike, but bear-leg bone is at right, human at left. Below, plaster chest models at laboratory show types of wounds inflicted by different-caliber bullets from varying distances





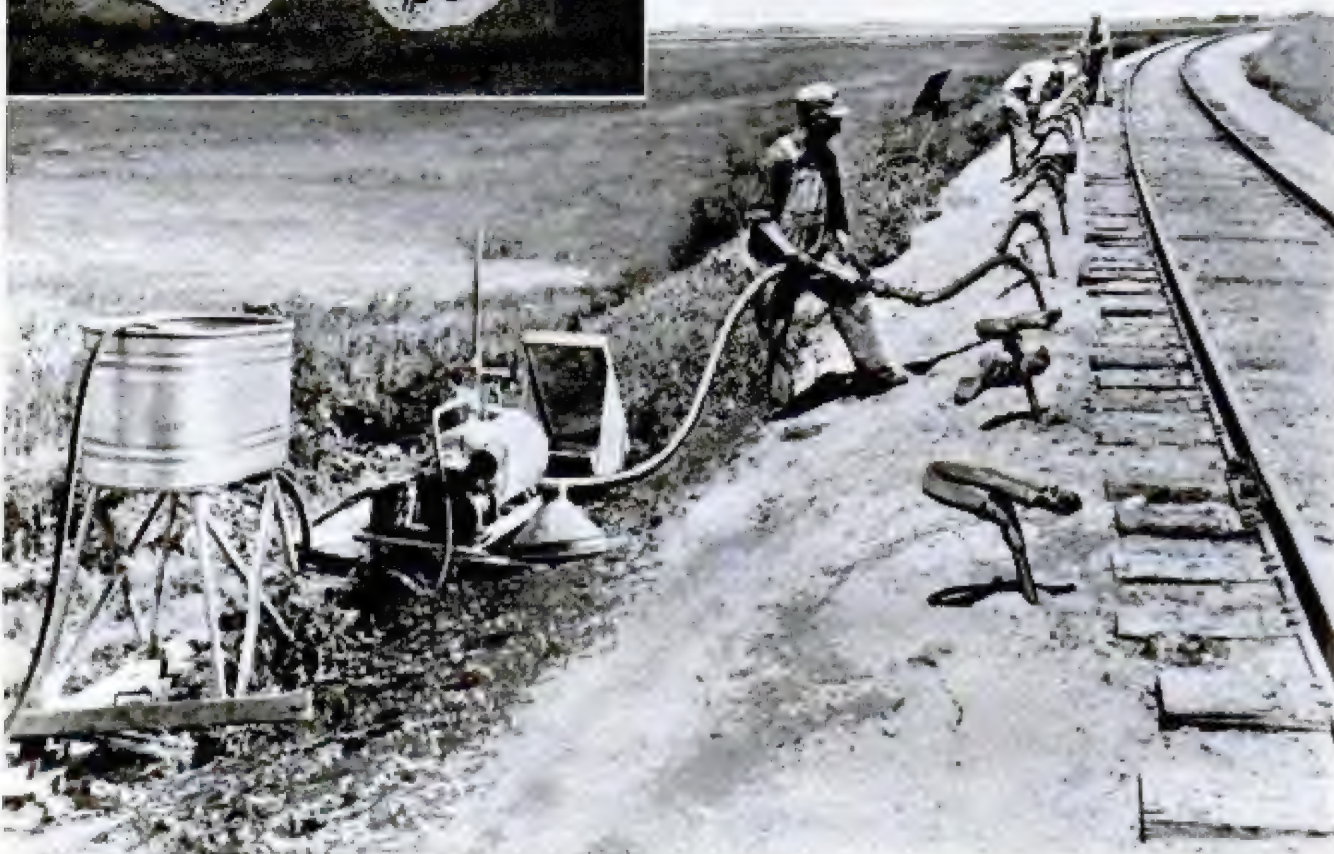
Powerful earth augers bore down beneath the road-bed to locate unstable areas of subgrade material



Huge "Hypodermic Needles" Inject Grout Into Roadbeds

AFTER LONG USE, railroad beds develop peculiar lumps and pockets. Repairing these rough or unstable beds is a difficult and costly operation. Now engineers are smoothing them by injecting grout beneath the beds through giant "hypodermic needles." Even finding the pocket sometimes is difficult, but the engineers have developed an effective drilling test to locate the areas where the subgrade material is poor. A repair gang uses a power-driven earth auger to make test borings between the rails. The holes are spaced 100 feet apart, and when troublesome stretches of track are found the borings are made every 50 feet or less to pin down the exact location. Material taken from the borings is plotted in cross section for analysis. Then other workers move in to repair the bed. They drive big grout pipes under the rails to reach the bottom of the subgrade. Through the pipes they force grout (a mixture of cement, water and sand) under pressures of 60 to 100 pounds per square inch. The grout displaces air, water and water-saturated materials. When it hardens, the bed again rests on a firm foundation to smooth out the rough areas.

← Cross section shows how pipes reach troublesome pockets deep beneath rails. Below, grout is forced through series of pipes. It hardens to fill pockets



Centrifugal Sump Pump Rests Outside Drain Pit

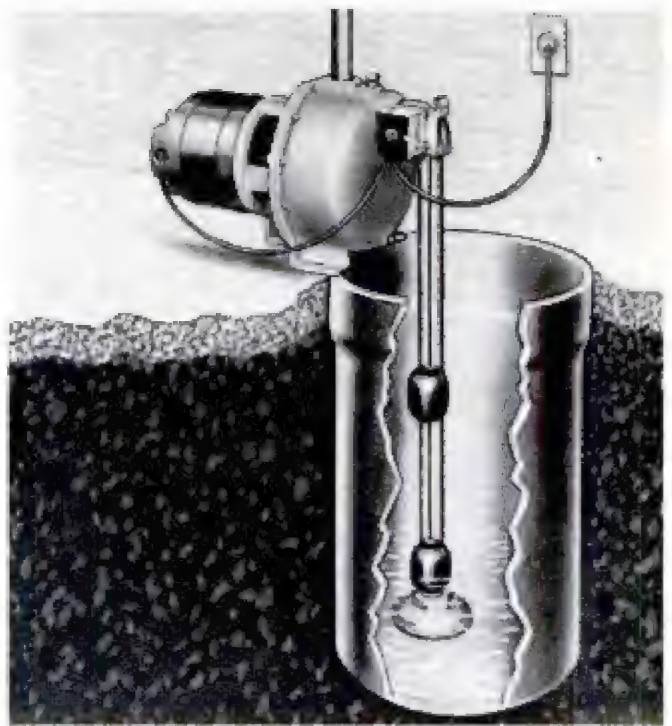
Motor and pump of a new centrifugal sump pump rest on the floor outside the drain pit, away from corrosive vapors and accumulations of sediment. By substituting longer pipe and wiring between switch and motor offsets, the unit can be placed on a near-by bench and the motor used for shop purposes during the day or freezing weather. Suitable for sumps two to eight feet deep, the self-priming pump attaches to a $\frac{1}{4}$ -horsepower motor. Since only the suction pipe and weights which turn the motor off and on are in the drain pit, cleaning the sump is little trouble.

Formula Makes Wool Mothproof

Added to wash or rinse water in the washing machine, a formula containing DDT makes washable woollens mothproof. Not yet on the market, the solution, EQ-53, was developed by the Department of Agriculture. The treatment is said to protect washable woollens from clothes moths and carpet beetles for at least a year.

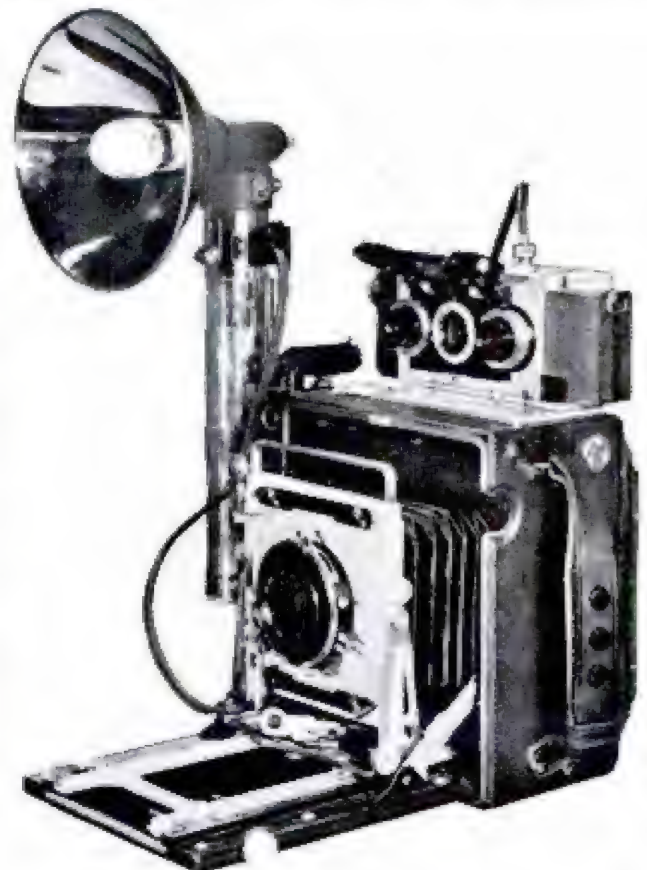
Flashing Gems on Lure Attract Fish

Imitation gems on a new fishing lure provide flashing underwater reflections to attract the fish. The gems are set in individual sockets and backed with aluminum foil. The lure, made of Tenite, is available in three colors—yellow, green and white.



Coupling Bracket Combines Press and Stereo Cameras

With a stereo camera riding astride his press camera, a photographer can now take three pictures with one exposure and one flash bulb. A bracket, which couples the stereo camera and the press camera, enables one shutter release to fire the flash bulb and trip all shutters simultaneously. The stereo camera automatically tilts to the proper angle for distances from four to fifty feet. Either one of the cameras may be operated individually without disconnecting the bracket.



DAREDEVILS WALK THE "BIG TOP" WIRES



By Annie Dyer Nunn

MILLIONS OF SPECTATORS under circus "big tops" have held their breaths during a long r-r-r-o-l-l of the drums while some spangled wire walker has casually defied death. The stunt may be a deft somersault or a complicated maneuver on a bicycle with somebody doing a headstand on the handle bar.

Millions have wondered what goes on under the spangles to produce these daring feats. How do performers know their feet will land on the wire which they cannot see during a somersault? What mysterious power keeps them from toppling off that ladder balanced on another performer's shoulders? Any daredevil of the wires will tell you it takes more than perfect eyesight and agility of mind and body, more than an inborn sense of balance and self-coordination, more than a temperament that refuses to be discouraged by bone-breaking falls. The art requires a sixth sense that always tells you where the wire is. Every big star has it. Another requisite is perfect mechanical equipment.

There are four kinds of wires: The tight, with a slight give; the bounding-tight, with a rebound of from 12 to 22 inches, depending on the length of the coil—from 22 to 49 inches—which holds the strand at one end; the slack, so loose that the center of the wire is but a few feet above the ground; and the Jap slack, half that loose. Each type has its specialists who are not interested in any other, since certain feats are adapted to certain wires.

Performers of the bounding-tight say that the momentum of this wire, which has a powerful vibration and a resistance of 2000 pounds, is as important to their act as their own jump. This is the wire which chalks up the most versatile of feats, and the trickiest. Here is where you see those incredible somersaults and handsprings.

Such tricks are not for the slack, which buckles, sways and swings—sometimes as far out as the curb ring. To stay on this charging demon is an accomplishment within itself. Thus, a feat which might seem mediocre on the bounding-tight could be spectacular on the slack.

On the other hand, the high-wire performers must have a wire that will stay put—a tight one, for the first consideration here is not to fall. Again, simple tricks are made startling by an element not their own—this time, height.

Wires may differ, even for the same general acts. The bounding-tight used by Con Colleano, world-renowned artist, is $\frac{1}{4}$ -inch English steel, 30 feet long and 9 feet high. The one favored by Carl Linares, Ringling Brothers' Swedish acrobat, is $\frac{1}{2}$ -inch cable, 22 feet long and 7 feet high.

Linares prefers this type to that used by



Dieter Tasso balances precariously on slack wire as he tosses cups and saucers to his head with one foot. Below, Hubert Castle does a hand jerk, revolving around wire, coming to rest in standing position





Linares comes out of backward somersault to land on one hand. Wire is anchored to a rubber apron, bound between two steel triangles, giving smooth rebound

Colleano; for when the English steel breaks, it parts on a slant, leaving a dagger-like point to fly back at you. Colleano concedes this drawback, but stays with the English steel because he considers it the toughest wire obtainable. He keeps breakage at a minimum by buying a new wire every six months. He has had but 11 breaks during his career of 25 years.

The slack wire used by the late Maximo, "Cuban wonder of the slack wire," was a cable $\frac{3}{16}$ inch in diameter, 44 feet long. "You can dominate a small wire," he said, "but a large one dominates you." Phil Escalante, another slack-wire artist, however, had a larger wire— $\frac{1}{2}$ -inch 30-strand cable, 50 feet long.

High wire, unless for exceptional stunts outside the big top, is $\frac{1}{2}$ -inch cable.

Crystallization is the greatest threat to the life of a wire. To prevent this, the ends of a strand are fastened to iron triangles by means of copper wire, on which cold soldering is used.

Novices are trained on low wires which are raised to higher levels as proficiency is attained. The slack wire is the hardest for beginners. Said Maximo, "You can learn to walk a tightwire in a week, with a balancing pole; but it would take six months on the slack."

A "mechanic" is important in practicing.

A heavy leather belt, it is attached to ropes extended from the ceiling of the gymnasium. The instructor stands on the ground and takes up the slack in the ropes when the fledgling falls, keeping him suspended in mid-air by means of the belt that was wrapped around his waist.

The low-wire artists with whom I have talked, began training when about eight years old, but 14 years is a popular starting age for those of the high wire. Action here is slow and balancing poles are used. This was the age of the 50 boys and girls taught in Europe by Camillo Mayer, French high-wire celebrity who had a troupe with Ringling Brothers last season.

Performers may or may not come from a circus family. Colleano and Maximo did; so did the famous Wallendahs (high wire) and high-wire artist Josephine Bersonini. Josephine has 90 cousins, all acrobats, half of them wire walkers.

Linares, Mayer and Hubert Castle—outstanding bounding-tightwire performers—are "private," jargon for those not born in the circus.

Basic tricks are routine. From them variations are invented to make an act unique. On the bounding-tight, for example, may

A member of the Mayer troupe lends a military twist to her act with a 150-pound "bomb" suspended below her as she rides her bicycle along the tightwire



be performed dances and somersaults. Colleano changed the backward somersault to forward. He capitalized, too, on dances, with a repertoire of intricate Spanish and ballet steps, which he does while discarding a sumptuous costume, piece by piece. The last garment, his silver-encrusted trousers, is shed in mid-air during a backward somersault, leaving him in red toreador pants.

The act performed by Castle is remarkable for his reckless one-foot maneuvering on a unicycle, somersaulting to the wire from a knee-hang, and somersaulting through a 25-inch hoop. Linares, who does a comedy act, also works with a hoop; but his most distinguishing feat is to come out of a backward somersault and land on one hand. Both of these men do the forward somersault—still an earmark of consummate skill.

The forward somersault is heartbreakingly difficult and requires years of unrelenting practice to master. It is a blind feat, for after the performer "throws," he sees the wire for only a split second and then not again until he lands on his feet. He must make the revolution guided only by his balance control and his sixth sense. They alone must tell him where the wire is, so that if he is coming down an inch or

two off the wire, he can twist his feet accordingly. Otherwise, all he can do is to try to break a fall on the wire.

On the slack wire, ingenuity is displayed in the handling of the wire itself and not so much in tricks. Standard, but difficult, are "the drunk"—where you stagger as you swing; the board trick—in which you stand on a board placed across the wire and swing; or the act of balancing a six-foot ladder on the wire and climbing to the top of it. Maximo could walk his thin, whipping strand with his hands in his pockets. Robledillo, a sensation wherever he went, introduced the slack wire to the United States about 1890. Old-timers report that he could run up and down the wire "with his feet above his head half the time."

The stock pile of tricks for the high wire includes but few of those performed on low wires; to gambol about at great heights would be to court suicide. The goal of the high-wire acrobat is to make his act seem more and more hazardous, and in this he has succeeded.

Years ago, the Wallendahs made headlines with this act: Carl would stand on a chair balanced on a rod which stretched from Herman to Joseph; then Helen would climb over the shoulder of Joseph and

The bomb explodes, and impact draws the bicycle and daredevil rider down and under the tightwire

Bomb has gone down. Girl hangs a moment, rights herself by means of a rope and continues her ride





Can Colleano, world-famed wire artist, prepares to do a forward somersault, most difficult feat performed on wire, which takes years to perfect



The moment before Colleano "throws" is one of intense concentration. The bounding tight-wire on which he performs is of sturdy 1/4-inch steel



The blind revolution. Here is where Colleano depends on his superb balance control and his sixth sense to tell him exactly where wire is



He has made it and is landing with both feet on the wire. Frequently he has to twist his feet an inch or two if coming down in wrong position



Colleano starts downward. After this instant it is a blind feat for he cannot see the wire until he lands on his feet at finish of somersault



After the successful landing on completion of somersault he must recover his balance. This is not easy, but Colleano manages by swinging foot



Robert Castle rides a unicycle along the wire. His unpredictable mount may pop from under him at any moment, has dashed him to the ground several times

stand on the shoulders of Carl. In this spine-chilling position they would travel the length of the wire. Today, it's being done with the two supporters riding bicycles.

A similar act was that of the Flying Alzanas. Harold rode a bicycle with Hilda balanced on his shoulders while two other performers swung from trapezes suspended from the wheels.

The Mayer act is crowded with thrilling feats: One boy sits on the wire while another steps over him; one clop-clops along on stilts; one girl balances on her back on the strand; another rides a bicycle with a 150-pound "bomb" suspended from it. The bomb explodes, pulling the bicycle over and under the wire.

One of the specialty acts of Josephine Bersonini is walking up a wire. Her $\frac{3}{4}$ -inch 58-foot cable has a 48-degree angle. She rumbas on her wire, which is 40 feet high; stands on her hands on the handle bar of her bicycle; and walks the wire wearing a blindfold. Her equipment is guyed by 24 wires and four "dead men." Like these other performers, she uses no net.

To high-wire walkers, height as such is

(Continued to page 230)



"Prairie Landscape" Appearance Isn't What It Seems

What looks like a prairie landscape of a lonely tree and shrubs silhouetted against a heavily overcast sky is actually a section of thin wire. The "trees" and "shrubs" are dangerous corrosion spots which could

cause the wire to snap, resulting in a costly equipment breakdown. Magnified 100 times, the wire was photographed with special equipment at General Electric's Erie, Pa., testing laboratory.

Deep and Cold Northern Lakes Are Termed "Wet Deserts"

Compared to the shallow, warm lakes of the tropics, Lake Michigan is an "aquatic desert," according to Robert F. Inger of the Chicago Natural History Museum. The average annual fish catch in Lake Michigan is 11,000 tons, for an average of a half ton

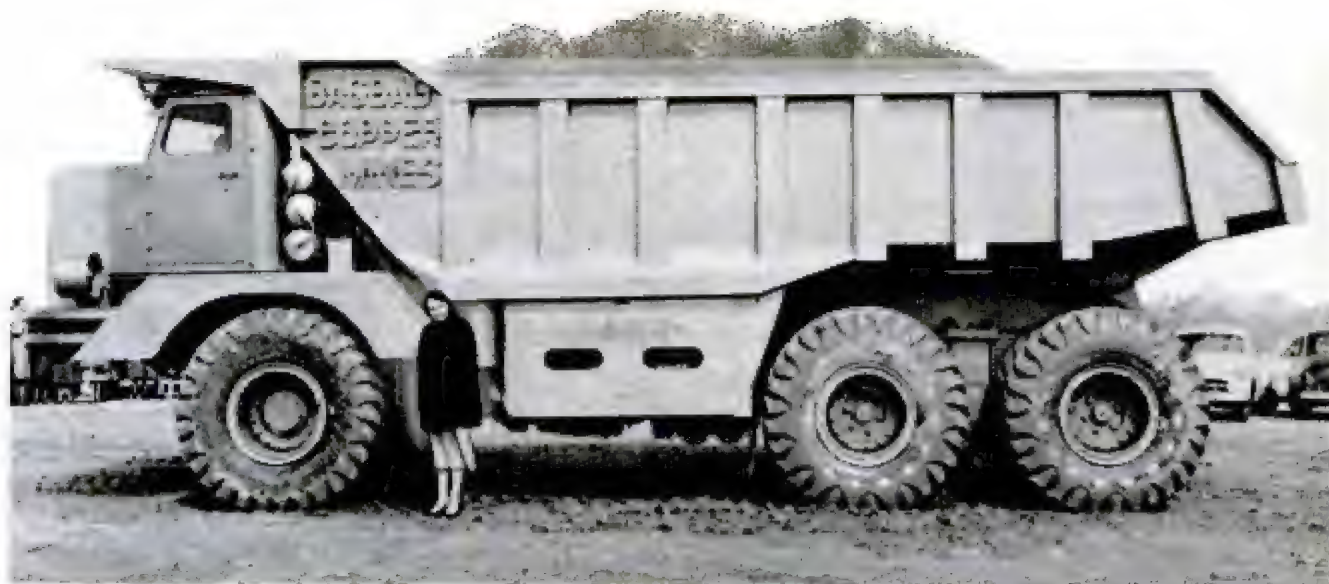
per square mile. By contrast, the Great Lake of Cambodia, Indo-China, produces an annual harvest of 100,000 tons—25 tons per square mile. Deep, relatively cold bodies of fresh water such as our Great Lakes, says Inger, are low in animal life.



English Bus Carries Baby Carriages

Latest aid to shopping mothers is a set of baby-carriage racks mounted on the front of an English bus. Suspended from hooks underneath the windshield, the carriages precede mothers to the business district, where they serve to extend and ease shopping activities. Recently on exhibit at the Commercial Motor Show in London, the bus is designed for use in New Zealand, where traffic problems aren't an obstacle.

☐ There were about 4,400,000 disabling injuries from home accidents in this country last year, results of which cost \$700,000,000 according to the national Safety Council.



GIANT:

Twin-Engine Truck Is World's Biggest

Fully loaded, a giant two-engined diesel truck weighs a quarter million pounds—60 tons of which are payload! Said to be the world's biggest, the Dart truck is limited to off-highway use. It has two diesel engines that develop a total of 700 horsepower and are suspended amidships beneath the body to drive the axles through separate torque converters. Leaves on the rear springs are almost two inches thick!



MIDGET:

Power Hand Truck Carries 800 Pounds

Not in the same league as the giant above, a motorized hand truck has a $7\frac{1}{2}$ -horsepower gasoline engine and is light enough to drive onto an elevator. Steering is with the front wheels which support the hydraulic or manual lift. The operator rides on a rear platform. The truck has a top speed of 9 miles per hour and will turn inside a circle with a 68-inch radius.

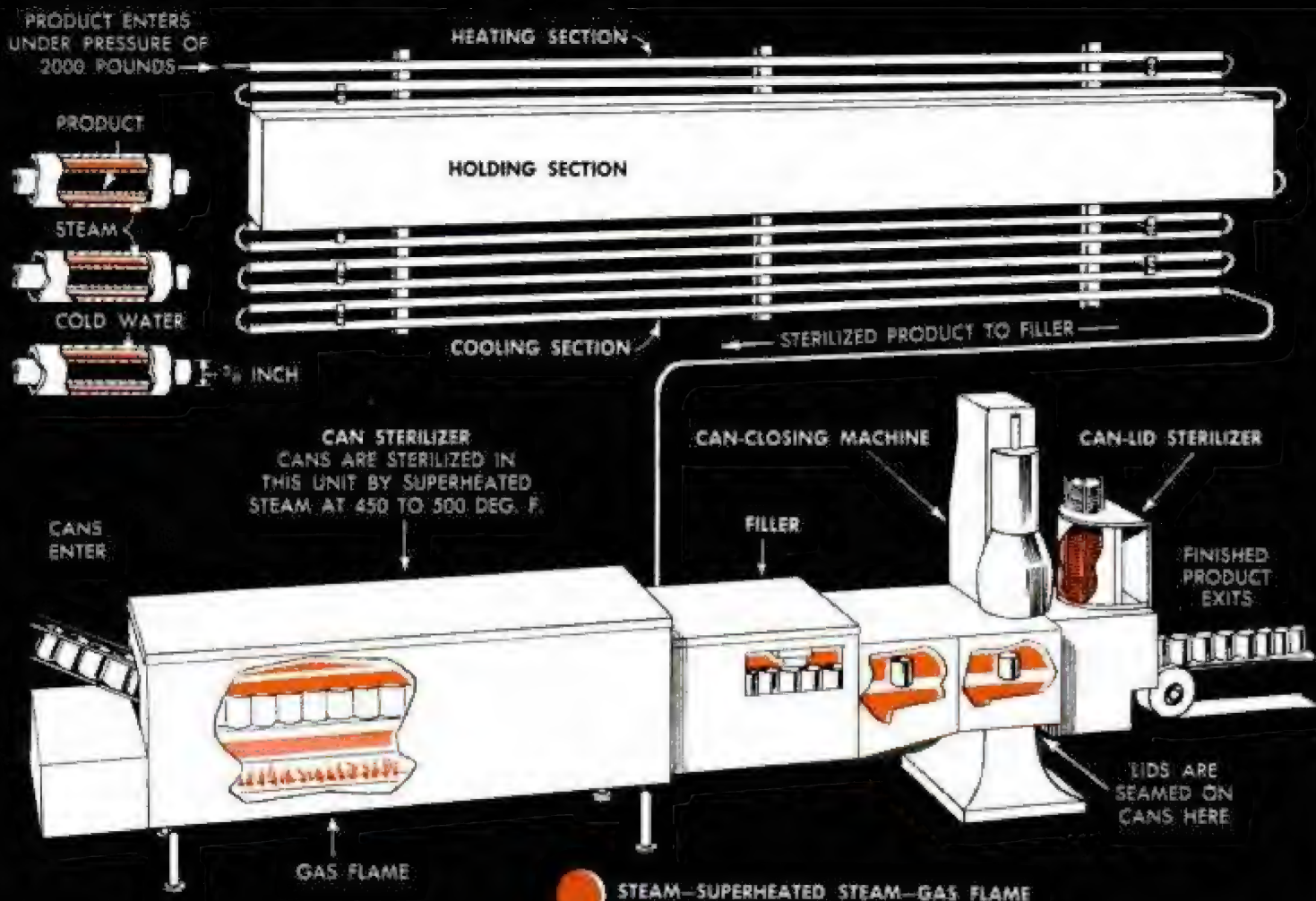
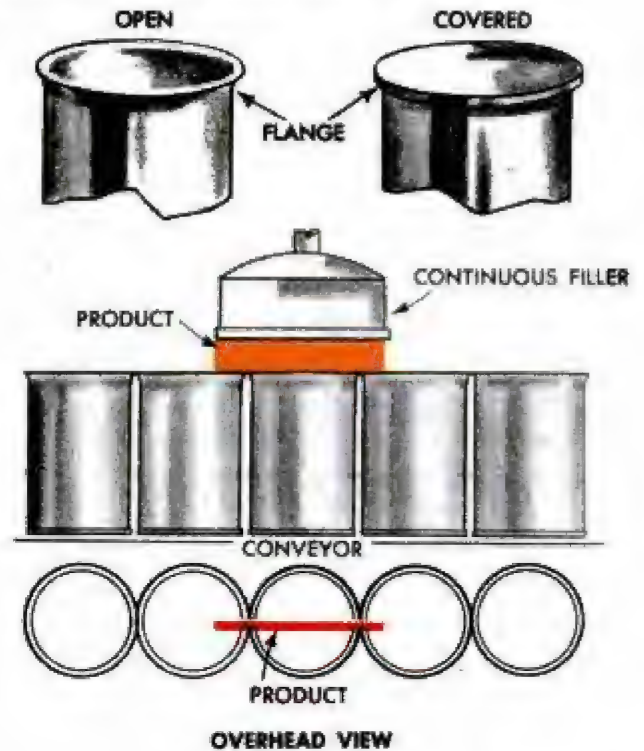
Speedy Canning Process Preserves Taste

CANNED FOODS with a fresh taste result from a canning process that may well be the canning industry's answer to frozen foods. The conventional canning method requires that cans be filled and sealed, then dumped into a huge cylindrical cooker for as long as three hours. It took a long time for heat to penetrate the barrier of food at the top, bottom and sides of a can and sterilize to the very center of the canned product. In the meantime, the outer portion of the food became overcooked, losing flavor, color and texture.

The new process shoots the product through narrow tubes surrounded by steam pipes, sterilizing it in seconds. Quickly cooled, the food streams into sterilized cans, lids are seamed on, and the job is done.

Split-pea soup in the improved process retains its fresh green color and original spicy flavor. It is sterilized at 290 degrees Fahrenheit for $3\frac{1}{2}$ seconds, retains that temperature as it flows through the holding section in 9 seconds, and is quickly cooled as it rushes through pipes encased in cold water. Meanwhile, empty cans move by conveyor through an enclosed steam cabinet over a row of gas burners on the floor which superheat the steam to a temperature of 450 to 500 degrees Fahrenheit. The constantly moving belt carries the cans under the continuous filler, a narrow slit

through which the product falls into the cans. A flanged edge on the rim of the can prevents food from spilling. Sterilized lids drop down and are clamped onto the cans and the canned product moves on. Milk, concentrated orange juice and many other foods are adaptable to the process.





Coin in Slot of Vendor Produces One Dozen Minnows

Now the fisherman can get live minnows by putting a coin in a slot. Two inventors of Nashville, Tenn., have developed a minnow-vending machine that eliminates the need for a full-time attendant. The machine is a water-filled concrete tank covered with transparent plastic. Slots cut in the plastic serve as tracks for cylinders that hold a dozen minnows each. The angler selects the

type of minnow he wants and slides one of the containers along its slot to a gate. When he deposits a coin, the gate releases the cylinder and he dumps the minnows into his own bucket. The tank has a circulation system and an aerator. A smaller tank releases sodium thiosulphate into the water to neutralize the chlorine content which is lethal to most minnows.

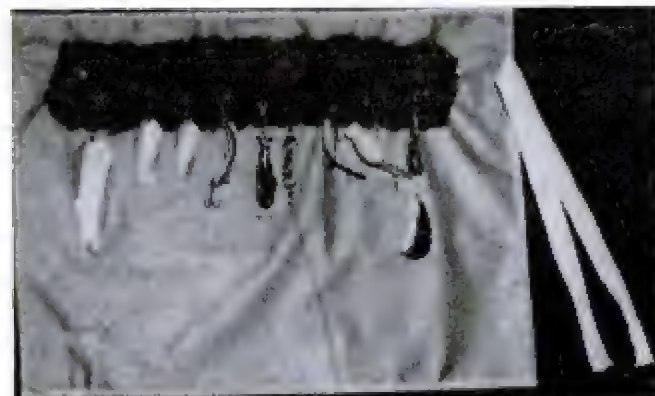
Angler's Lure Made From Flexible Hair Curler

Ingenuity and a woman's hair curler have produced a new fishing lure. The body of the lure, which resembles a shrimp, is made from the plastic curler. A bristly tail is fastened to the curler, and the hair-holding loop is clipped to form antennalike feelers which help keep the hook from snagging in seaweed or grass.



Roll-Up Plastic Case Keeps Hooks Tangle-Free

Fishing lures are carried without damage to the baits themselves or to the angler inside a roll-up case made of heavy plastic. The hooks of the lures are embedded in a furry material to keep them from tangling.



Telescoping Fishing Rod Fits Into Coat Pocket

Handy to carry on trips, a regulation-length fishing rod now available completely telescopes into its handle. It is only eight inches long when telescoped and can be tucked into a pocket or glove compartment.





Here's the hitch: Driver picks up ticket when he enters highway, pays about 1.5 cents per mile as he leaves

Here We Go on Our --- Million-Dollars-a-Mile

By Dick Frederic

YOU CLIMB behind the wheel of your car in Portland, Me., curl down an access ramp to a multilane superhighway and roar up to 60 miles per hour on the $\frac{1}{4}$ -mile acceleration lane. You slip into the traffic and maintain that pace all the way to Minneapolis, Minn. Crossroads soar over your head or you soar over them. The ribbon of highway stretches out in gentle slopes and deep, wide curves. On landscaped parkways and freeways, you circumvent some cities. At others, you cut

through nonstop canyons between walls of skyscrapers. You can reach Chicago in less than 24 hours of driving; Minneapolis some 10 hours later.

A dream? Not quite. A chain of superhighways, now partly complete, already enables the traveler on the congested coasts to "leapfrog" over ancient bottlenecks. Within a few years he should be able to make that high-speed Portland-to-Minneapolis trip.

The Pennsylvania and New Jersey turn-

Here's the benefit: Jersey Turnpike soars over factories, streets and rivers on stilts, has fast interchanges

New Jersey Turnpike Authority photo





American Automobile Association map

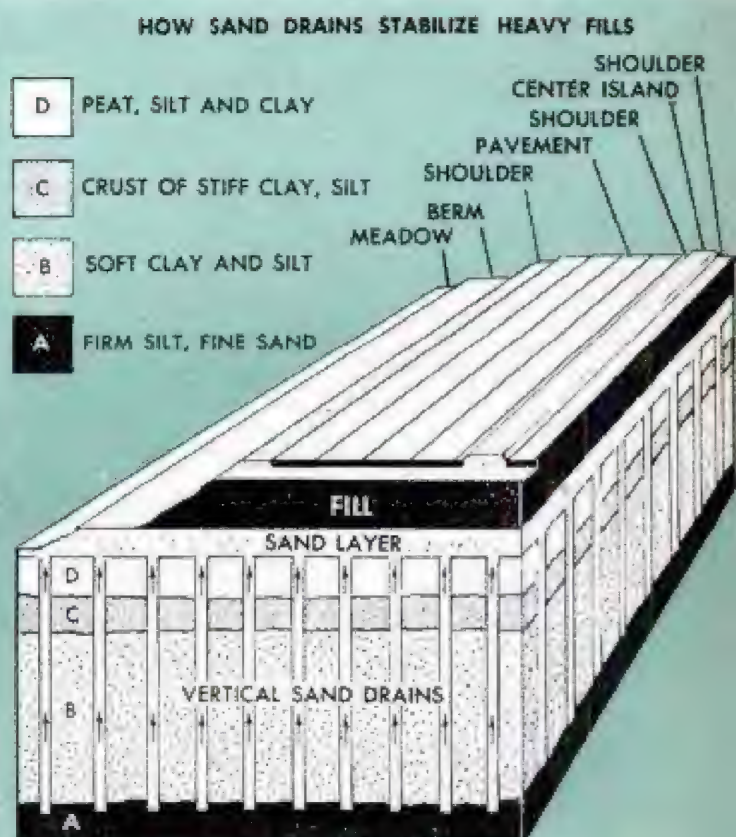
Toll Roads

piques and the New York Thruway, now under construction, are the backbone for a framework of superhighways that seems destined to lift the motorist from the mire of snarled traffic jams in which he has wallowed for 20 years. If all goes as planned, another five years may put wings on his wheels.

Highway projects are afoot all over the country. Here is the pattern: Ohio has authorized a 241-mile expressway linking the western end of the Pennsylvania Turnpike with the Indiana border. A proposed superhighway in Indiana will hitch on to it and carry the motorist to Illinois. When these roads are complete, a man will be able to drive from the George Washington Bridge in New York City, down the New Jersey Turnpike, and pick up a proposed express link to the Pennsylvania Turnpike without a pause. He'll roll across to Pittsburgh, ride a multilaned link to the new Ohio superhighway, soar on to Indiana, cross that state on a massive express pike and pick up an elaborately ramped expressway, now under construction, that will carry him straight to the heart of Chicago's Loop without a stop.

New York's 535-mile, four and six-laned thruway—already building between New York City and Buffalo via Albany—will

Map shows toll roads superimposed over basic highway system laid out in 1941 by the Bureau of Public Roads as ideal network. Note how toll roads already are following basic pattern. Diagram below shows how sand drains remove moisture in swamp area





DALLAS, TEXAS



DETROIT, MICH.

one day connect with this vast Pennsylvania-Ohio-Indiana system, carrying express traffic from New England to points west and south.

On the East Coast, Maine is planning to stretch its present north-south pike from Portland to Augusta and, some day, north to the Canadian border. Massachusetts proposes to link the north-south Wilbur Cross Parkway bisecting Connecticut with the southern terminus of the New Hampshire Turnpike. It will be done via a recently opened expressway that already bypasses Boston's ancient horn-honking alleyway snarl.

Down the coast, New Jersey has a green light to extend an express spur between Paterson and Cape May. A 34-mile pike from the Virginia line to Nags Head, N. C., is being planned. A cross-state pike in West Virginia may some day tie in to the Pennsylvania and Ohio pikes. In Tennessee, a proposed turnpike between Chattanooga and Memphis will link with a proposed Georgia system streaking down to Cartersville—and eventually to Calhoun. Florida has designs for a Jacksonville-to-Miami pike, with a spur over to Tampa.

Two new turnpikes still in the dream stage for Pennsylvania would express the motorist from Pittsburgh to Erie, and from the Maryland line, in the east, up to Port Jervis, N. Y.

The East isn't alone by any means in the big express-pike boom. Oklahoma is building a 94-mile turnpike between Oklahoma City and Tulsa. Another proposed interstate-superhighway chain would whisk the motorist from Denton, Tex., straight up through Oklahoma and on to Topeka, Kans., tying in with a high-speed superhighway to St. Louis on the Missouri end. Slashing down from St. Louis in a more southerly direction, a proposed pike would connect directly with Tulsa.

A great 300-mile cross-state pike is under

LOS ANGELES, CALIF.



study for Wisconsin, too, and Texas may have a multilaned concrete ribbon between Dallas and Houston. Iowa, Maryland (considering three separate pikes into Washington) and Kentucky are considering the feasibility of great pikes that would cross their states east-to-west and north-to-south. And Michigan wants to build three toll roads from Detroit—to Chicago, Toledo and Bay City for \$250,000,000.

If all these roads materialize you'll be able in a few years to whisk almost nonstop at 50 to 70 miles per hour from Canada to Key West; from Chicago to any of a dozen East Coast cities and vice versa.

How far along are these dream roads? Already more than 750 miles of superturnpikes are built; another 620 miles are building, 785 more have been authorized and some 1000 miles are under study.

But there's one big clinker in the grate. That

TOLL HIGHWAYS

BUILT AND IN SERVICE

Name	Length Miles	Cost
Overseas Highway (Key West).....	122	\$ 8,500,000
Pennsylvania Turnpike.....	327	240,750,000
Westchester County (N. Y.) Parkways.....	25	25,000,000
Merritt and Wilbur Cross Parkways in Connecticut	67	38,000,000
Maine Turnpike.....	44	20,600,000
Buccaneer Trail, Fla.....	17	4,600,000
New Hampshire Turnpike.....	15	7,500,000
New Jersey Turnpike.....	118	255,000,000
Denver-Boulder Turnpike.....	17	6,000,000
	752	\$605,950,000

UNDER CONSTRUCTION

New York State Thruway.....	535	\$500,000,000
Turner Turnpike (Okla.).....	88	38,000,000
	623	\$538,000,000

AUTHORIZED

		Estimated Cost
Ohio Turnpike.....	241	\$326,000,000
Carolina-Virginia Coastal Toll Road.....	54	2,450,000
Pennsylvania-New Jersey Turnpike Connection..	39	*50,000,000
Georgia—Cartersville to Tennessee line.....	65	*52,000,000
West Virginia Turnpike.....	88	96,000,000
Garden State Parkway (N. J.).....	168	285,000,000
Massachusetts East-West Toll Road.....	130	150,000,000
*Unofficial estimate	785	\$961,450,000

PROJECTED

	Length Miles
Indiana Turnpike.....	190
Maine—Extension of Maine Turnpike to Augusta.....	58
Massachusetts—Wilbur Cross Highway to N. H. Turnpike.....	110
North Carolina—Virginia line to Charlotte.....	125
Florida—Jacksonville to Miami.....	350
Wisconsin—Part of new highway, Chicago to Twin Cities.....	250
	1083

PORTLAND, ORE.

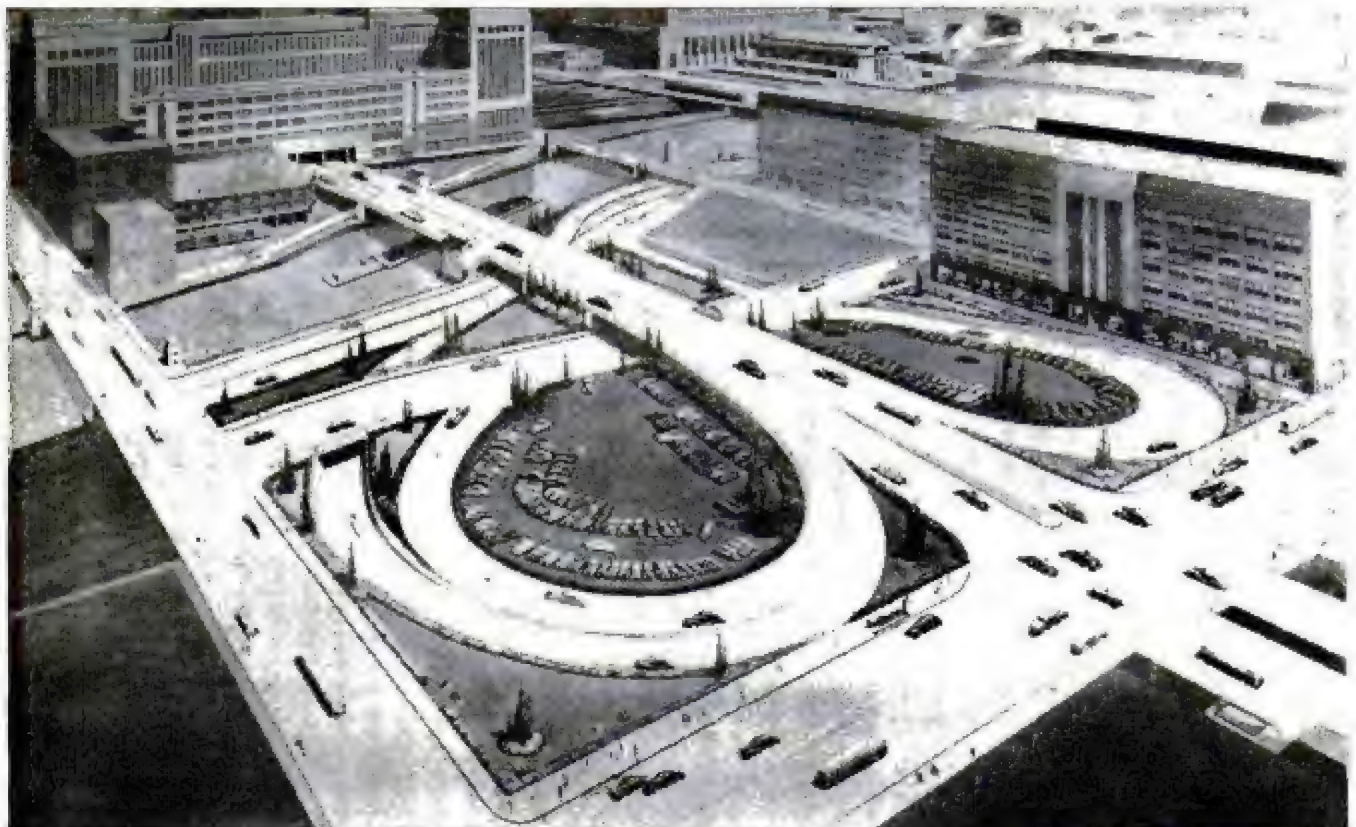




Depressed superhighway to Chicago's Loop will have railway in center with four high-speed lanes on each side



To make room for the highway, a swath one block wide was cut for eight miles through heart of the city. Huge clover leaf will siphon off Loop traffic. Motorists will drive through center of post-office building





Connecticut State Police photos

Radar nabs the speeder: Instrument tested by Connecticut police rates speed of passing car on a graph

trip from Maine to Minnesota, for instance, will, according to American Automobile Association officials, cost Mr. Motorist between \$15 and \$20 in tolls—or about 1.5 cents per mile. If he added this cost to the price of his gasoline for the trip, it would come to something like 56 cents a gallon. For most of these new highways are pay-as-you-drive roads, financed by bonds.

What does all this mean? It means, first, that the great 40,000-mile interstate network of roads, laid out in 1941 by the Bureau of Public Roads as the basic superhighway system for the nation, may at last be on the way. The new superhighways are hewing close to its specified routes. Second, instead of being free roads as the bureau planned, the great system, linking nearly every city of more than 100,000 population, may be dotted with toll gates.

Is this good or bad? Few issues have been as hotly debated by experts. But the fact is that nearly every state is studying turnpikes as one way out of our king-size traffic jam and inadequate road system. Their interest is based on the \$53,000,000 in tolls collected by Pennsylvania Turnpike authorities during the big road's 11 years of operation. Added enthusiasm was whipped up when New Jersey's superhighway exceeded traffic estimates by 51 percent, and revenue by 21 percent in its first few months—which meant it could pay for itself in 25 years instead of the 35 years originally figured.

JULY 1953



Camera, teamed with radar, photographs offender's license. Radio alerts patrol car to catch speeder

Whether Mr. Motorist is nicked at the toll gate, at the gasoline pump or when he sends in his registration application, one thing is certain: Our new superroads—free or toll—are setting the pace for a revolution in highway design and travel.

High-velocity pikes are not for Sunday drivers. The New Jersey Turnpike is typical. Motorists get a ticket where they enter and pay where they get off. The four velvety blacktop lanes, each 12 feet wide, have a designed speed of 70 to 75 miles per hour. This means that a driver traveling that fast can navigate every turn and grade safely, can read every sign clearly and will find the 1200-foot acceleration and deceleration lanes—tacked alongside the outer lanes at each interchange and restaurant or service concession—entirely adequate for joining or leaving the high-speed traffic. Actually, the limit on this pike is 60 miles per hour—to provide a safety factor. A median strip 16 feet wide separates opposing traffic over most of the route, and five-foot-wide paved shoulders guard cars against overturns.

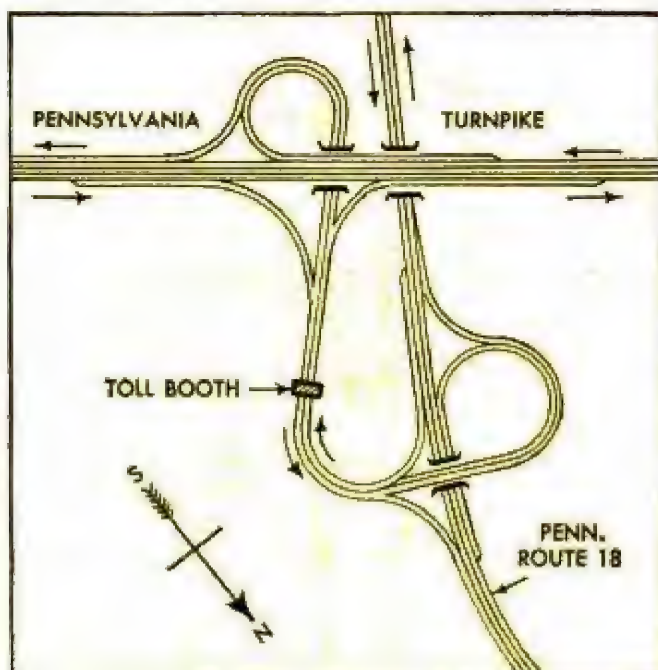
Vast interchanges curl gently down to the underpassing or overpassing highways via sweeping ramps that may cover a total of 80 acres. Right at its northern entrance, the four lanes take off onto a viaduct that sails over the jumble of factories, refineries and smelters of a huge industrial valley. On a sweeping curve, it ducks beneath an arch of the Pulaski Skyway and shoots out across the swampy Jersey meadows. To

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Bureau of Public Roads photo

Mountain is literally pushed to one side in California to make way for new superhighway into Los Angeles



make the roadbed stand up in these swamps, engineers drove forests of 20-inch steel pipe into the muck, filled them with sand and pulled out the pipes—leaving columns of sand behind. These, acting as wicks, drained moisture from the bogs and provided a solid foundation for the heavy-duty highway. In some places, the ground settled 12 feet before it was dried out.

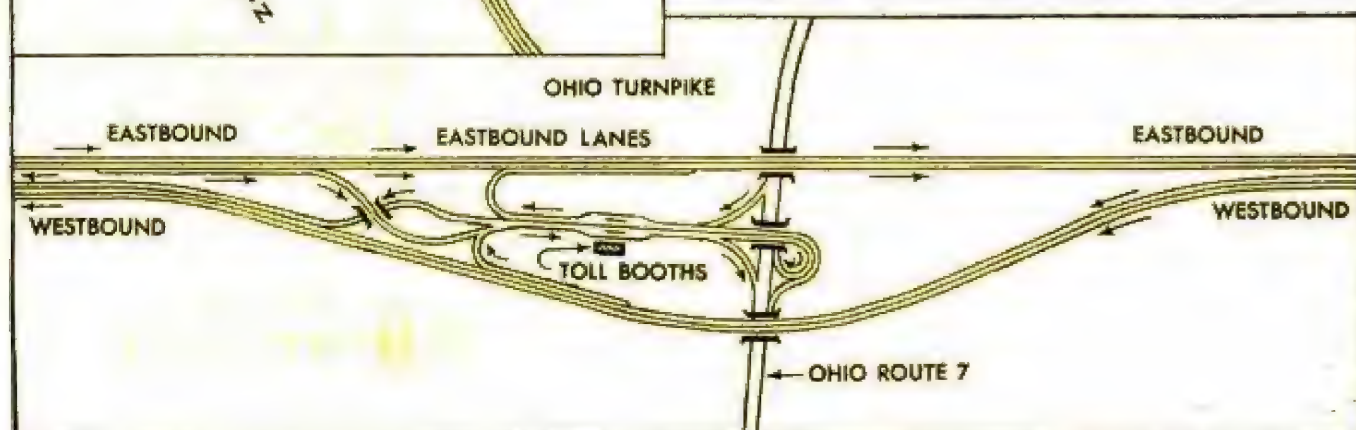
A big problem with these superroads is that they're too good. The Pennsylvania Turnpike, completed in 1942, was the first of the real high-speed toll roads. Its easy grades, boring through mountains via reconditioned old railroad tunnels, and its wide banked turns built for 70 miles per hour, proved quickly that drivers got drowsy on long stretches and reacted too slowly at rocketing speeds. To overcome monotony, the Jersey Turnpike actually has hills and turns built into it for variety. No center plantings obstruct the interesting view across the rolling country. Beaded reflecting signs with huge block letters announce each interchange a mile before it arrives. Lines of glass-beaded white paint separate the lanes so they're brilliantly visible day or night, and reflecting posts, 150 feet apart, mark the borders of the highway on each turn.

New Jersey's Turnpike hadn't been opened a month when one new high-speed ogre showed its face. One misty morning a car barreled down the pike at the legal 60 miles per hour and suddenly plunged into a dense fog bank. The driver couldn't see 20 feet, so he slammed on his brakes. A car trailing crashed into him full tilt. More cars joined the wreckage, and before the fog lifted that morning, some 65 vehicles, including huge trailer trucks, lay in mangled heaps across the roadway; four people were dead and 40 injured.

Engineers considered lifting fog with

(Continued to page 242)

Below, engineers suggested reverse traffic flow on Ohio Turnpike, so motorists would drive in left lanes, putting slower traffic in center where toll booths, service stations and restaurants would be located. Plan is unlikely to be accepted. Left, typical interchange on Pennsylvania Turnpike for comparison





TV camera behind hotel desk relays view of caller to guest's room. At right, remote shopping with television

Hotel Residents View Guests and Groceries on TV

In a Chicago hotel recently, residents had reason to believe that the "Television Age" had really arrived. Callers were picked up by a video camera at the desk, and their images appeared on TV sets in individual rooms. One woman ordered her groceries over the telephone as clerks in the food

shop stepped before the camera with vegetables and choice cuts of meat. Two midget camera-transmitters were used in the demonstration. A cable linked them to the master TV-antenna system which feeds 106 standard sets in the guest rooms. The camera units used an unoccupied channel.

Electric Divining Rod Spots Underground Water

"Water witching" has at last gone scientific—but instead of a forked willow wand, an electromagnetic device is used to locate underground water. Developed at the University of California, the device uses two wire coils to locate water-bearing strata.

One coil induces an electric current into the ground. The other measures the differences in the induced current as it flows through the ground. Different types of water-bearing strata are characterized by their degree of conductivity.

Freeze-Drying Technique Improves Microscope Photos

More information about the sizes and shapes of bacteria and viruses is being obtained by freeze-drying the specimens before they are examined by the electron microscope. Previously used was an air-drying method that squashed microorganisms into two-dimensional shapes and made them appear larger than they actually are. The new technique, developed by Dr. Robley G. Williams of the University of California, quick-freezes the specimens in their original three-dimensional shapes.



Left photo shows, as a flat specimen, an organism 1/2000 inch long that was air-dried before examination under an electron microscope. Freeze-drying of specimen, right, reveals its original three-dimensional shape

Lawn Roller Pulled By Small Garden Tractor



Rolling your lawn is no chore with a roller which may be pulled by a small garden tractor. The driver rides a sulky attachment between tractor and roller, his hands on the handle bars of the tractor, his right foot resting on a pedal which operates a scraper to dislodge soil packed on the roller. When the roller is operated by hand, a positive-set lever maintains the scraper position. Filled with 25 gallons of water, the roller weighs 266 pounds. It is 24 inches wide and 18 in diameter.

Inflatable Fire Boat

Junior is kept afloat and entertained at the same time by an inflatable fire boat with realistic features. The vividly decorated toy has a whistle in its smokestack and a water squirter for quenching fires—both operated by pressing the sides of the fire boat. It measures 31 by 20 inches.



Sunshield Fits Like Glasses

Worn like glasses, a lightweight shield shades the eyes from the sun's glare. The shield's nonreflecting underside prevents reflections from below. Made in blue, yellow, red, green, ivory or black, it fits securely enough to be worn while playing tennis and other active sports.



Through the Periscope

Next month we proudly present an article by one of the greatest submarine authorities of all time, Rear Adm. Charles B. Momsen. In his answer to the question "Will the New Submarines Rule the Seas?" Admiral Momsen offers a fascinating look at our latest undersea killers, including the nuclear-powered sub, and suggests some major changes in the design of tomorrow's underwater craft. It's an article of great significance. Don't miss it

Iceproof Road in Germany

Snow and ice — the bane of motorists — cannot form on a 550-yard stretch of highway near Hamburg, Germany. The road is coated with a tar mixed with an emulsion of chemicals. The chemicals, in conjunction with electromagnetic radiations from the earth, dissolve the snow and ice as fast as they form. The experimental highway will remain free of ice and snow even at minus 78 degrees Fahrenheit.



St. Louis terminal will have three huge rooms, free of columns, and "finger" passageways leading to planes

You're Looking at

By Aubrey O. Cookman, Jr.

COMMERCIAL FLYING'S biggest problems today are on the ground. In the sky, better aircraft and the wonders of radar have steadily pushed most of the hazards and uncertainties out of air travel. All-weather flying, on schedule, is almost an accomplished fact.

Ralph S. Damon, president of Trans World Airlines, says, for example, that during 1952 only 1.1 percent of their domestic Constellation mileage was canceled because of weather.

Down below, though, progress has been much slower. Over much of the United States, airliners are operating out of cramped, outmoded fields, conceived when air travel was in its swaddling clothes. Planes grossing 135,000 pounds are rumbling over runways built in length and strength for doughty pioneers like the 25,000-pound DC-3, the "Model T" of the airways. Ticketing and loading facilities have been similarly outgrown.

Those were the days when 20 landings

spelled a busy day at many major airports. Last year Chicago's Midway averaged 809 movements daily. The airlines carried more than 27,000,000 passengers in 1952 and conservative estimates are that this will grow to 40,000,000 by 1960.

Further complicating the airport-planning problem is the anticipated wide use in the late '50s of jet liners, with their powerful, scorching engine blast and loud noise. Still another factor is the probable popularity of helicopters by then for interurban taxi and short-haul trips.

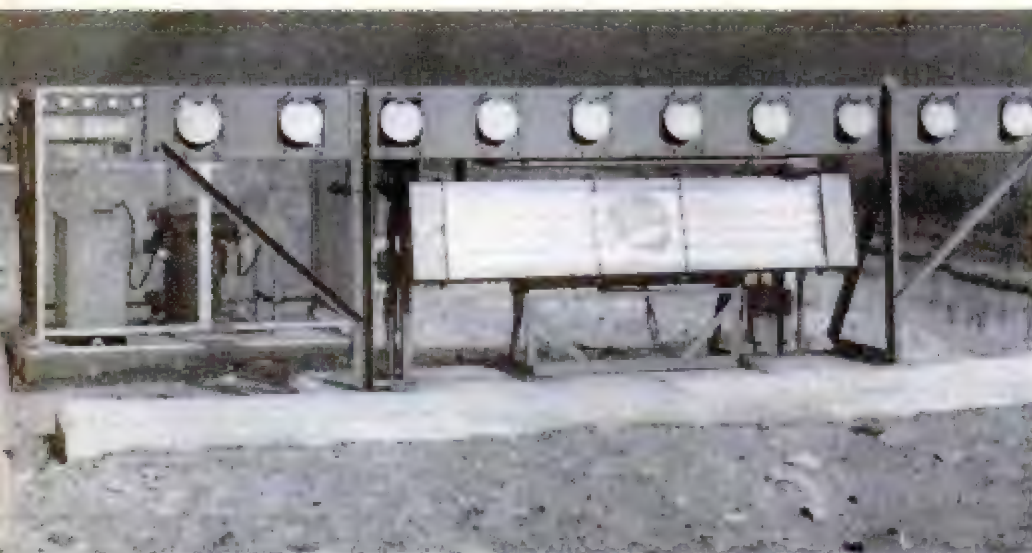
What changes can we expect to see in the appearance of tomorrow's airports? The picture is taking shape in every major population area. Sixteen cities boast new terminals and many large ones, like Chicago, Los Angeles, Cleveland, St. Louis, Philadelphia and Cincinnati currently have work under way.

The single most important influence in shaping things to come is the Civil Aeronautics Administration. In addition to



Port of New York Authority photos

Pilot's-eye view of Newark's new runway, with 3000-foot approach-lighting system and a parallel service road. Below, close-up of one of the 14-foot landing-light bars, with 10 high-intensity lamps above a "rabbit" light



having experts on every phase of airport planning and construction, all available for advice, it is in the key position of passing on all requests for federal financial help to build new fields. Since 1947, the government has appropriated \$214,000,000 for this purpose. The CAA also decides what airports are adequate for airline use.

One significant change is that communities are being urged to build fewer runways, according to Merle Hemphill, deputy director of CAA's office of airports, and to make them nonintersecting. To avoid cross winds, heavily used fields have always been interlaced with runways, with only two at the most—for landings and take-offs—ever used at the same time. This "jack-straw" assortment of concrete strips was an expensive, complicated concession to the wind. It would be even more so today, when a single runway sturdy enough for Stratocruisers costs more than \$2,500,000, including land, drainage, paving, lighting and other incidentals.

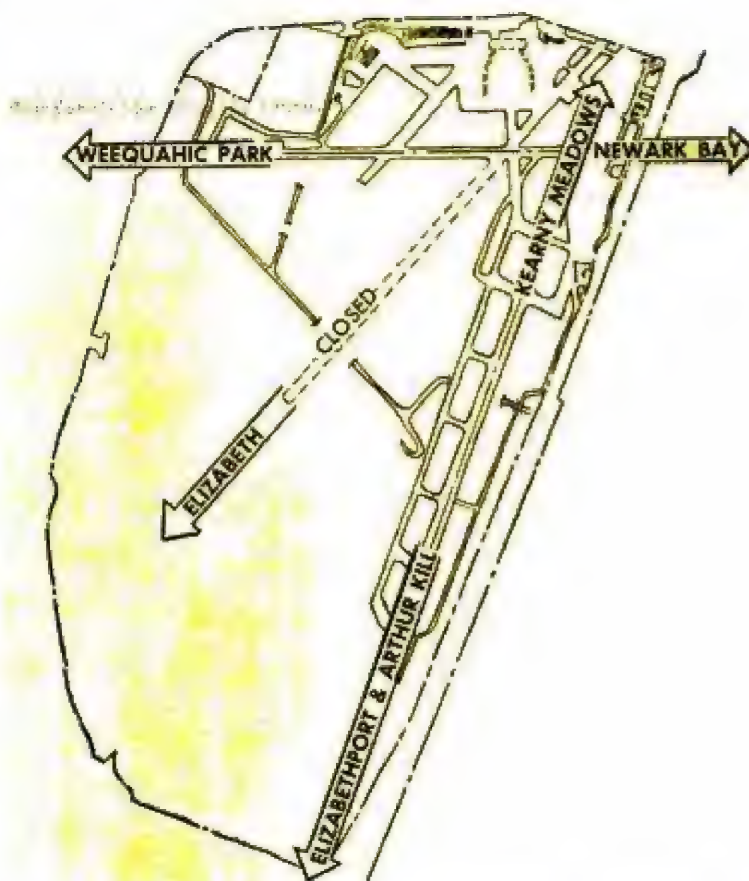
Fortunately, it is no longer necessary. Development of the tricycle landing gear and the trend to faster, heavier aircraft has now made the cross-wind factor almost negligible. Volumewise, the safe landing rate in visual weather has been increased to one per minute per runway, a flow sufficient to quickly saturate most terminals. The experts, incidentally, agree that the one-per-minute landing rate will soon hold true for instrument weather as well.

"Only in high variable-wind areas," Hemphill says, "will another runway direction be needed, and that should be at right angles to the first. The

high-wind condition that required it would also enable it to be shorter than the main one." TWA's Damon agrees there will be fewer runways needed in the future, adding that traffic growth could be best handled by adding runways paralleling the original pair, rather than having them laid in new directions.

Another problem future designers must consider—location—was brought into focus at Newark, where the field was closed after a series of crashes into neighboring Elizabeth, N. J. As a result, a major runway was abandoned and another, with complete all-weather instrumentation, built for the express purpose of avoiding residential Elizabeth on take-offs and landings. Now the two main runways route most of the traffic over Kearny Meadows as well as Newark Bay.

The CAA has other economic reasons for its simplified runway argument. The costly equipment needed for all-weather operation, such as precision-approach radar, an instrument-landing system,



Newark abandoned center runway to avoid flights over Elizabeth

Runways 25 inches thick, already needed for today's biggest bombers, may be required for future giant airliners

Portland Cement Association photos

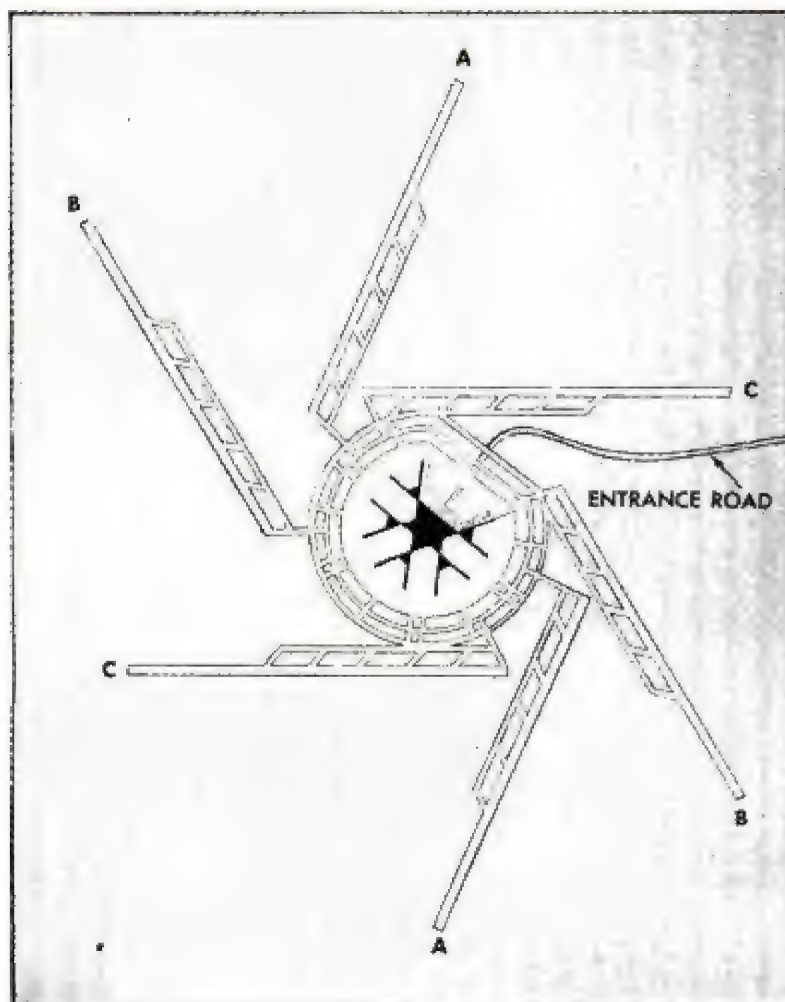




Pittsburgh Plate Glass Co. photo

Pittsburgh terminal's roomy control tower has slanted, glare-free windows, specially built to resist cold, solar heat

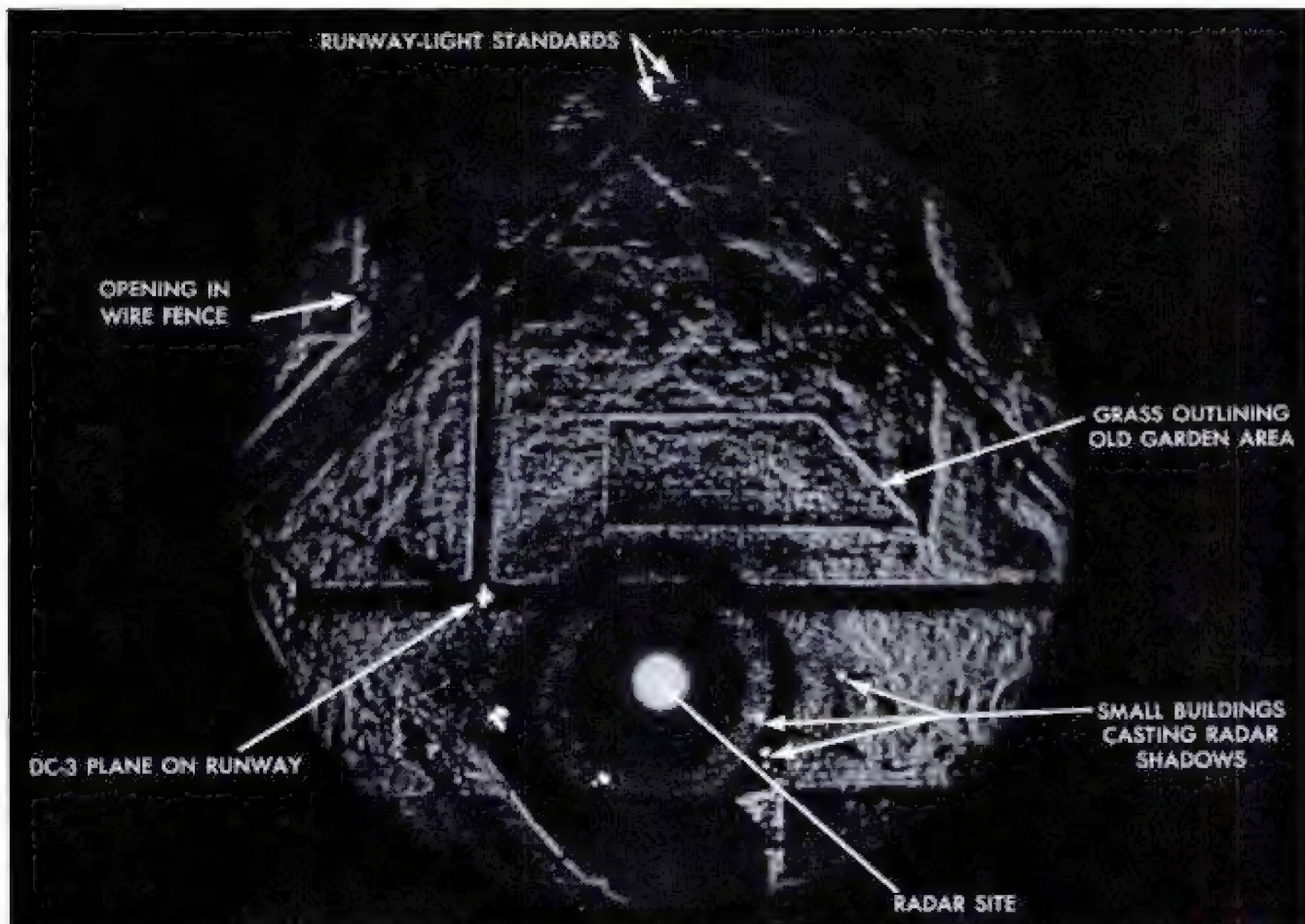
At O'Hare, parallel runways A-A, B-B and C-C will be used in pairs, with planes landing on one and taking off from the other



high-intensity approach and runway lights, as well as surface-detection radar, is too expensive for most communities to install on more than one strip. Fewer runways would also simplify snow removal and general maintenance.

For very heavy traffic, one of the soundest runway arrangements for the future appears to be at Chicago's O'Hare-International Airport. There, six nonintersecting runways will extend in a tangential pattern, like bent spokes on a wheel, from the central terminal area. All will be used simultaneously, since their approaches diverge sharply and allow plenty of room for safe air navigation. Traffic will move toward the center in landing and away from it on take-off. O'Hare is expected to operate by 1955 and take much of the traffic pressure off Chicago's Midway, for the last five years the nation's busiest field.

Increased runway capacities will come from another CAA-promoted feature at O'Hare, the "bleed off" taxiways. These are 45-degree turnoffs, spaced at 1000-foot intervals along the runways, from the 3000-foot mark on. They allow



Civil Aeronautics Administration photo

At night and in poor visibility, radar offers an easily deciphered surface picture of the entire airport area

landing planes to veer out of the main traffic stream at the completion of their roll, clearing the runway for approaching aircraft.

Warm-up aprons for two or more planes, located at the runway ends, have shown at Washington National Airport that they'll speed up take-off traffic. Warm-up times vary and the aprons enable airplanes ready to fly to bypass others, regardless of their arrival order at the runway end. Thus, a whole procession of departing planes isn't slowed by the lengthier warm-up time needed by a few.

Two illumination improvements that pilots will welcome are a new high-intensity, controllable-beam runway light and airport taxi-guidance signs. Already installed at Milwaukee, the ball-shaped lights are visible from almost every conceivable angle. When visibility is poor, increasing the current also slants the beams inward more sharply from the runway sides. Lighted letter panels 14 inches square make the new CAA guidance signs readable at great distances. Resembling street signs and spotted at runway intersections, they will probably reduce

Narrow, sweeping beam of the surface-detection radar equipment can show a man walking across the field more than a mile away





Pittsburgh Plate Glass Co. photo.

Seven-story terminal at Pittsburgh has a 62-room hotel, theater and an observation dock for 10,000 people

tower-pilot communications about directions. In bad weather, clearing off the instrument runway rapidly is an important problem and the signs will enable pilots to bleed off the pavement at the first proper intersection.

A new photoelectric device, the transmissometer, instantly relays visibility reports to the tower from as far as 10 miles away. It can also control the brightness of airport approach and runway lights. Prior to the transmissometer, tower operators have had to rely on their own judgment in determining visibility ratings.

Seven years of tests by the Airline Pilots Association, the Air Transport Association and the CAA led to changing the old parallel lights outlining the approach to the runway.

At Newark this new approach lighting substitutes a single row of 14-foot-wide bars, perpendicular to the flight path and extending at 100-foot intervals for 3000 feet into meadowland. Mounted on each bar are ten 250-watt high-intensity lights with 80,000 candlepower, forming an artificial horizon to help pilots keep their planes level. An extra-wide light bar at the 1000-foot mark reminds the pilot he should be 100 feet above ground at that point.

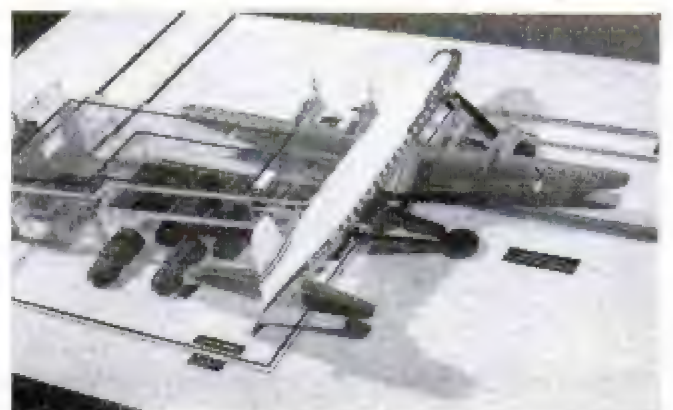
A series of 30 condenser-discharge lights is mounted in the center of each light bar. Called the "rabbit" by pilots, these lights

flash on and off in rapid sequence to give a continuous tracer-bullet pattern toward the runway. Each flash takes only 175 millionths of a second. The rabbit effect whips down the approach-light bars at a speed of 4000 miles per hour, develops 600,000,000 candlepower and can be seen on a clear night over Philadelphia, 60 miles away. Both San Francisco and Fort Worth have been authorized to build similar systems.

Newark also has high-intensity runway and taxiway lights every 100 feet instead of the usual 200, in accordance with the latest CAA standards. Runway markings also conform to the new rules, with three-foot-wide solid-white stripes along the full

(Continued to page 254)

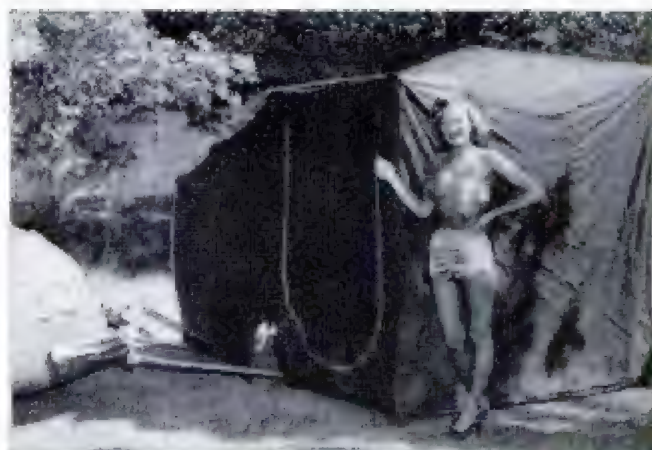
United Air Lines proposes towing planes over tracks to "air dock" and loading directly by conveyor belts



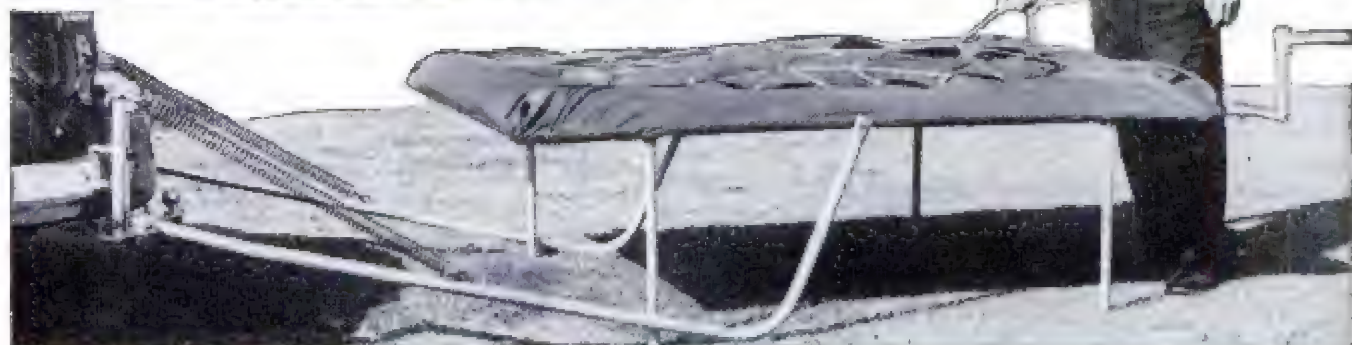
Fast-Erecting Tent for Auto Campers Hinges to Rear Bumper

It takes only five minutes to pitch camp for the night when you have an ingenious tent-and-bed outfit atop your car. The light metal frame of the kit is hinged to the rear bumper at one end; the other end rests on the roof. To set up camp, you swing the assembly down so it rests on the ground. The metal frame supports the tent roof and a spring bed as well. No stakes are required. The tent has a full canvas floor and "zippered" door. Inside is a comfortable double bed and additional room for two cots, if

desired. Weight of the entire camp is only 65 pounds. Once the tent has been erected, the car can be detached and driven away.



Carried atop car, the tent and bed swing down as a unit, below. In five minutes, it's ready for use, above

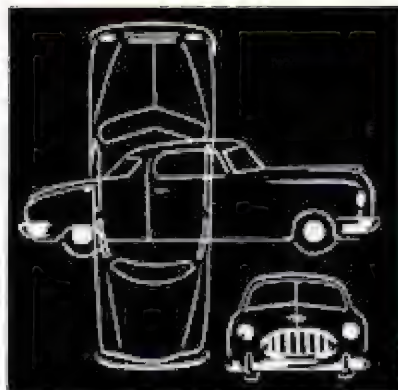


Inner-Tube Sailboat Has Removable Mast

Attaching a sail to an old inner tube is the latest fad of the younger "yachting" set. A tiny prow and stern fit on each side of the tube and are connected by a flat board underneath. A plastic sail attaches to a removable mast. The skipper rests crosswise to the direction of the craft and manipulates the sail with his right hand. Quickly deflated and packed for carrying, it is designed for the old swimmin' hole.

Information not listed on articles in the index, starting on page 12, frequently is listed in the WHERE-TO-FIND-IT LIST, which is available to readers without charge. A copy of this list may be obtained simply by sending a postcard to the Bureau of Information, Popular Mechanics Magazine, 200 East Ontario Street, Chicago 11, Illinois





Detroit Listening Post

By Leo Donovan

THE 1953 MODELS offered more and costlier changes over-all than in many years, so don't look for major body, engine or chassis changes in the 1954 package that dealers will offer. There will be a couple of new engines—part of the evolution of power-plant replacement.

Economics control such things, of course. It would cost about \$70,000,000 to switch from a six to an eight-cylinder engine.

The big year for major body changes is expected to be 1955. By then the industry will have more experience with plastics.

Behind the scenes, the auto industry has been proceeding cautiously on the plastic-body problem and not just for technological reasons. Plastics makers were willing to go along on a limited basis during the sports-car-development period, but now prospects are so immense they want to start with schedules 40 times higher than those set by the auto manufacturers.

The plastics makers want to make more than just armrests, glove-compartment doors and steering wheels—they want to add doors, panels, fenders, deck lids and hoods to the list of plastic parts.

Surprising as it may seem, the cost of an automobile body runs about 40 to 50 percent of the total production cost. If the motor-vehicle manufacturers are to cut costs while adding automatic transmissions, power steering, power brakes and air conditioning, the body is one place to start.

However, most auto engineers will tell you that the biggest field for plastics in the immediate future is in plastic dies for particular sheet-metal forming and stamping operations. They're cheaper and in many cases have stood the test of volume runs.

Engineers are contending that within a few years the driver will use his left foot exclusively for the brake and the right foot for the accelerator. Many drivers are doing that right now. The popularity of automatic transmissions which eliminate the clutch pedal promotes the trend. Power brakes add to the likelihood.

Manufacturers have made it convenient for the driver to shift his right foot from the accelerator to the brake pedal without removing his heel from the floor. This means

faster stops because it reduces leg motion before the brakes go on. It was accomplished by establishing a common height for the brake and accelerator pedals.

But there is still the chance that the driver's foot might slip off the brake pedal and onto the accelerator. Hence studies are in progress on designing the brake pedal for left-foot operation.

An ever-increasing percentage of car production is equipped with automatic transmissions. High-price cars like Cadillac, Lincoln and Chrysler have only a little way to go to be producing all their cars with automatic transmissions. Packard plans to increase its percentage above the 77-percent figure because the spring market indicated even greater demand for Ultramatic.

Oldsmobile and DeSoto production also is almost entirely composed of cars with automatic transmissions. Buick worked a lot of overtime to boost its percentage of Dynaflo-equipped cars to 80 percent, the best it has done since it was introduced.

But the real volume will come when Chevrolet and Ford get the increased facilities operating at capacity this fall. Plymouth's semiautomatic transmission required a big investment, but engineers are working on other models, seeking greater simplicity and lower-cost production.

Increased horsepower and speed point up the need for better brakes. Friction heat still is the biggest obstacle, but by next year Electric Auto-Lite Co. will introduce improved air-cooled brakes, promises L. H. Middleton, director of engineering. Eventually, he adds, electrohydraulic braking will combat the heat problem.

Middleton also came up with a surprise when he announced that six-volt electrical systems have been improved to where they now are better than the recently introduced 12-volt systems—and cheaper, too. Some 1954 cars, he said, will have a new six-volt high-frequency coil and double-contact distributor with a cam that adjusts to the torque of the engine. These and other improvements in the six-volt system may make some of the predictions of the swing to 12 volts not quite accurate. It is obvious that the six-volt systems are not done yet.



Portable Dock "Shinnies Up" Its Built-In Caissons

Using the same mechanical principle that a boy does when he "shinnies up" a tree trunk, a new dock climbs right up its own caissons. The unique dock is built as a barge and floated into position. Complex jacks then go to work and the dock shin-

nies up its built-in supports. In a matter of hours it can let itself down into the water again, hook onto a tug, and move away to a new location. The docks are being studied for use in military operations, offshore drilling and commercial port service.

Cart Has Scuffproof Compartment For Each of Golfer's Clubs

Golf clubs fit into individual tube compartments in a caddy cart that eliminates the golf bag. The dentproof plastic club holder, an integral part of the cart, holds 14 clubs separately to avoid damage from scuffing and banging. Zippered plastic compartments provide space for golf balls, tees, score cards and a sweater. With the adjustable handle lowered and wheels folded in, cart and clubs fit easily into a car trunk or locker.

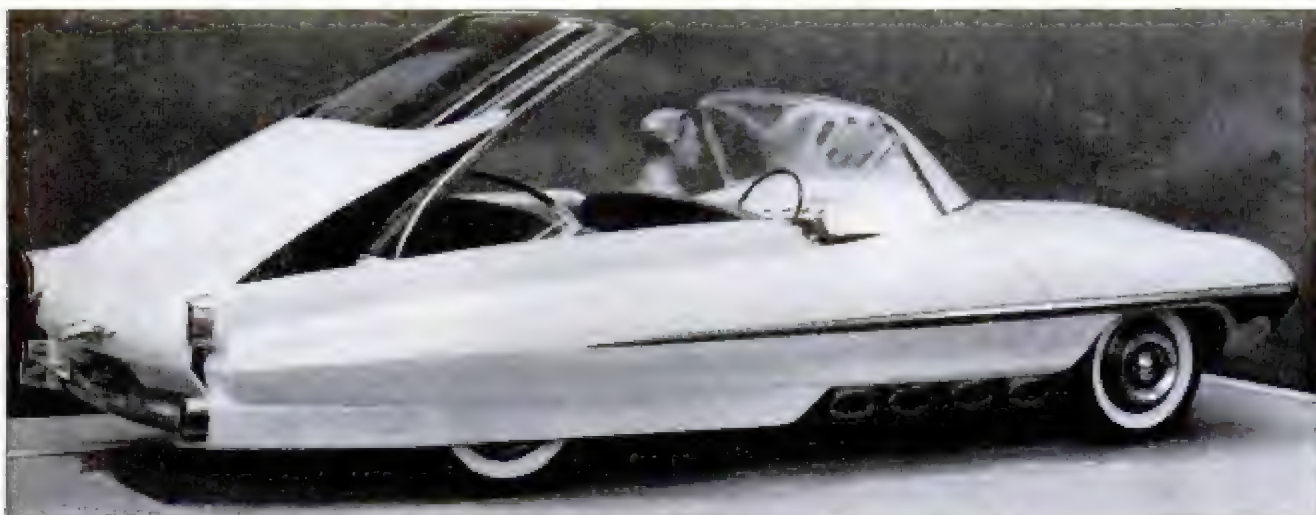
How to Split Water

Two Massachusetts Institute of Technology scientists have split water into the two gases that compose it by merely dissolving in the water compounds of the element cerium and setting the solution in sunlight. It is a simple substitution for a task formerly requiring an electric battery. One compound makes use of energy it absorbs from sunlight to combine with oxygen to become ceric perchlorate and set free hydrogen. At the same time, ceric perchlorate by the aid of sunlight can be reduced again to the original compound, giving off oxygen in the seesaw process.





Not slated for production, the model hints at future style trends. It has steel top, one-piece rear window



At the touch of a button, the steel top retracts into the trunk. It does not interfere with luggage space

Ford Hardtop Really Converts

Ford's advance-styling experts have come up with a hardtop convertible that really converts. Built as a scale model only, the steel top swings down inside the trunk automatically.



Rear window swings forward as tonneau windshield or back out of sight

Collector's Aid Loosens Stamps From Envelope Backings



For stamp collectors there is a new container that loosens stamps from their envelope backing, leaving them almost dry. Up to 10 stamps can be processed at one time, and the container also can be used to separate stamps from each other or from hinges. Treating a stamp does not alter its watermarks or colors.

If you do not find the information you need in the WHERE-TO-BUY-IT INDEX, starting on page 12, sources of further information are available without charge from Bureau of Information, Popular Mechanics Magazine, 200 E. Ontario St., Chicago 11

Sturdy Sapling Grown in Weeks

TREES, VINES and shrubs can now be produced in weeks instead of years. Using a specially treated plastic sheeting, the new method—known as air-layering—produces new plantings in three to eight weeks instead of one to ten years. The plastic sheeting—waterproof but permeable by gas—induces growth of new roots on stock intended for transplanting while still attached to the parent stock. The sheeting is treated with water-soluble plant foods, root hormones, insecticide and fungicide to promote fast, healthy growth of new plants. A branch one fourth to three inches in diameter is selected, a section of bark removed, and the wood scraped clean. A moistened ball of moss or soil is placed around the area of the cut and wrapped completely with the plastic sheet. In three to eight weeks, new roots, which can be seen through the transparent sheet, start sprouting. When they are well developed, the limb is cut from the parent stock and transplanted. Limbs up to six inches in diameter have been successfully transplanted.



Selected limb is girdled with sharp knife, and a cylinder of bark removed. Wood is scraped clean



Moistened ball of sphagnum moss is packed about the exposed area to relay nourishment to future roots



Treated sheeting is wrapped about the moss and tied



When roots are developed, limb is cut from parent

Plastic covering is removed carefully so as not to disturb roots or moss, and new tree is transplanted



Time elapsed: Five weeks. New tree is equal in size to a normal three-year-old tree grown from seed



all Hands



U.S. Coast Guard official photos

Laying aloft, the Coast Guard cadets go up the main shroud of the *Eagle*. Left, photogenic from any angle, the square-rigger is as pretty as a calendar picture

THE DAYS of the Yankee Clippers are not gone yet—not so long as young Coast Guard cadets climb the rigging of the tall, white-hulled sailing ship *Eagle*.

The 1634-ton *Eagle*, a three-masted square-rigger built in Germany as training ship for Hitler's navy, has served as a summer-training ship for cadet officers since 1949, sailing out of the United States Coast Guard Academy at New London, Conn.

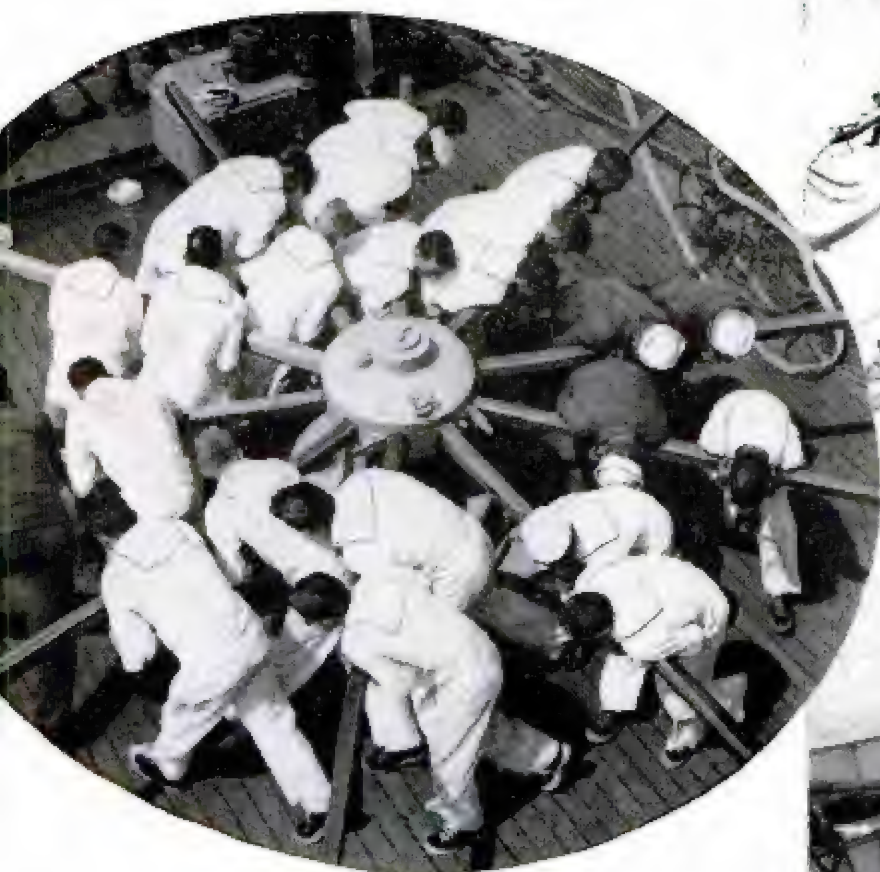
On practice cruises aboard the *Eagle*, young cadets get their sea legs. The complex network of her rigging is a laboratory for prac-





AS THE COAST GUARD LEARNS TO SAIL

By William O. Foss



Top right, cadets swarm on the yards to furl sail for the last time as a summer cruise ends. Above, excitement runs high as cadets heave around on the capstan bars, weighing anchor for a cruise to Norway. Right, making up a sail before taking it below

ting seamanship. Cadets "lay aloft," clambering up the shrouds and out on the yards, to furl and unfurl 22,000 square feet of canvas.

They learn to handle sheets, braces and tacks to set the sails. They get intimate with the tedious routine of chipping, painting and polishing. Usually, lower classmen do the deck work, while the seniors handle navigation. Summer cruises touch such interesting places as England, Norway, Sweden, Denmark, Brazil, Mexico and Caribbean islands.

The former German trainer, taken by the United States as reparation after World War II, is 265 feet long. Her tallest mast is 150 feet high. With the right breeze, she cuts through the water at 18 knots under full sail. A 700-horsepower diesel auxiliary below decks helps out when the wind dies down.

★ ★ ★



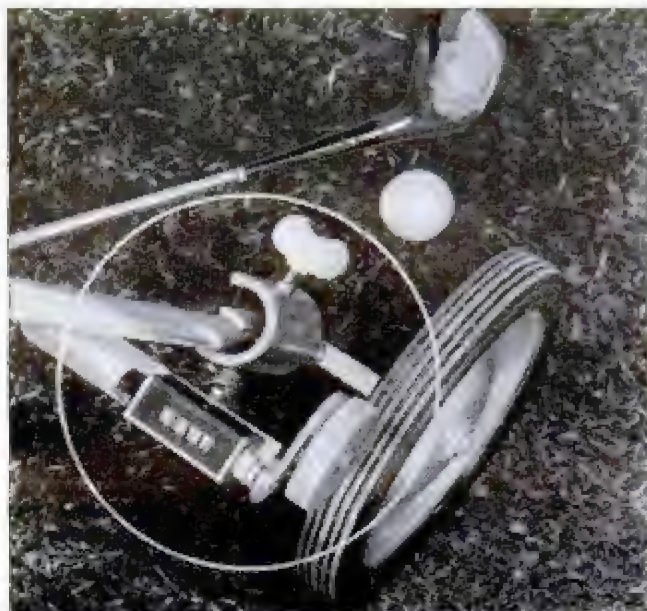
Roller Kit With Tray Attached to Ladder Speeds House Painting



Now you can paint the exterior of your house with paint rollers, save time and coat the surface evenly. A handy kit includes a 5½-inch roller, a smaller lap roller, a hooded paint tray and an adjustable bracket for holding the paint tray on the ladder. The lap roller solves the difficulty of painting the bottom edges of clapboards, shingles, moldings and overlaps—formerly the main obstacle to roller painting. The hood on the paint tray prevents spillage when moving the ladder and permits the tray to be filled with paint and carried in a vertical position.

Power-Driven Boatway Rolls Craft Into River

Small boats are launched and taken from the water by a power-driven way at one dock on the Colorado River. Bub Williams of Bullhead City, Ariz., constructed the way from scrap parts. The drive is a hydraulic landing-gear transmission from a surplus B-29, and is powered by a one-horsepower electric motor. The winch drum is from a bomb-bay control. The boat rests on an improvised carriage made from auto parts that rolls on lengths of water pipe.



Yardage Meter Mounted on Cart Checks Distances for Golfers

Attached to any caddy cart, a rustproof meter keeps a record of yardage covered during a golf game. With the device it's easy to check the distances of shots, the efficiency of various clubs or the yardage of a course. No adjustments need to be made; the meter will give an accurate reading regardless of cart-wheel size.

❏ Ceramics are plunged from a temperature of 5000 degrees Fahrenheit to a frigid minus 320 degrees in less than a second at the Argonne National Laboratory, thus freezing the high-temperature structure changes for later study of the material used in nuclear reactors.

Frost-Chasing Wind From Tower Propeller Protects Citrus

Artificial wind protects citrus groves from frost damage. A helicopter-type propeller mounted on a steel-pipe tower and driven by a heavy-duty electric motor, forces the air down against an adjustable diffuser which spreads the air over a 360-degree area. Producing a wind of 38 miles per hour, it draws 230,000 cubic feet of air per minute. A thermostatic control starts or stops the machine as temperature changes.

Helicopter De-Ices Telephone Lines

Technicians of the Pacific Telephone and Telegraph Company at Yakima, Wash., have put the helicopter to work to combat ice on telephone lines. The downdraft from the huge rotary blades of a helicopter, flying a short distance above wires loaded with frost after a freezing fog, clears the wires of frost and prevents their breaking under the load.



Trigger Winder Permits Camera To Take 36 Photos in 25 Seconds

Fast-sequence photography is made possible by a trigger-winding device that attaches to the base of Leica cameras. It permits as many as 36 exposures in 25 seconds or less. The mechanism for the rapid winder is contained in a special baseplate that replaces the regular camera baseplate. No factory adjustments are necessary. The trigger is pulled down to wind the camera instantaneously. The winder fits all Leica cameras with serial numbers above 400,000. Special carrying cases for the trigger-winding cameras are also available.

Model-A Ford Rolls Lawns

Rolling lawns can be hard work, but not for an Illinois gardener who replaces the wheels on his Model-A Ford with rollers. He drives back and forth on the lawn and when done puts on the wheels again.

☐ Treating of seed wheat with actidione completely prevents wheat disease known as covered smut.



Army's Cable Tester Does One Hour's Work in One Minute



U. S. Army photo

One hour's work, testing a guided missile's 100 or more cables, is done in one minute by a new device developed at the Army's Redstone Arsenal, near Huntsville, Ala. Its inventor, Albin Wittmann, is a former German V-2 scientist. Some of the troubles it detects are short circuits, faulty insulation and open contacts. The tester can be adapted for use in such things as jet airplanes, telephones and other devices in which cables are used. It stops when a fault is encountered and, at the same time, a light goes on indicating the type of fault and also the number of faulty wires.

Electric Trimmer Cuts Grass Along Walks and Fences

With a new electric lawn trimmer the homeowner can cut grass right up to foundations, fences and trees, and clip a neat edge along walks and flower beds. The trimmer, which operates from any 115-volt outlet, has a tubular-aluminum handle with a toggle switch at the end. The cutterhead is partially enclosed to deflect stones and dirt away from the operator.



No-Stoop Applicator Kills Weeds With Sponge

Weeds are given an individual dose of a chemical killer by a new applicator that eliminates stooping. A reservoir on the bottom of the handle holds 16 ounces of weed-killing solution. Below the reservoir is a sponge with a built-in valve. The operator places the sponge over the weed and presses down slightly on the handle.





Swimming Pool Built in a Lake

AT CYPRESS GARDENS, FLA., there's a unique swimming pool which juts out into the middle of a lake. Designed as the setting for a motion picture, the \$30,000 pool has the shape of the state of Florida and was drawn to scale from a standard road map. It is made of concrete and steel, with the entire top surface covered with broken ceramic

tile. The length "from Key West to the Georgia line" is 87 feet and the maximum depth is 5½ feet. Water for the pool is pumped from a 310-foot well located 250 feet away. The level of the lake is about 18 inches below the top of the pool, which had to be designed heavy enough so it wouldn't float away.

MOST OWNERS REPORT BETTER MILEAGE THAN THIS

The OWNERS

1. I own a 1953 Chevrolet: "One-Fifty" ☐ "T" ☐

"Bel Air" ☒ Speedometer reading: 2516

2. I use regular gasoline ☐ Premium (high test) gasoline ☒
3. Average gasoline mileage in city: 14 m.p.g.; in country: 17 m.p.g.
4. Oil consumption: One quart every 1000 miles. I change oil every 1000 miles.

5. My Chevrolet is equipped with: Thrift-King 108-h.p. engine and conventional trans. ☐
Blue-Flame 115-h.p. engine and Powerglide automatic transmission ☒

6. If your car has the new Blue Flame engine (with aluminum pistons and other improvements), please state your opinion of this engine: Plenty of power but motor is slightly noisy

7. Roadability: Excellent

TOPEKA, KANS., PLUMBER

FREQUENT COMPLAINT OF OWNERS

7. Roadability at high speeds: Excellent ☐ Good ☒ Unsatisfactory ☐
8. Maneuverability in traffic: Excellent ☒ Good ☐ Unsatisfactory ☐

9. Powerglide owners comment on: a. Acceleration from 0 m.p.h. good
c. Performance in traffic good
b. Acceleration from 50 m.p.h. good

Standard-transmission owners comment on: a. Acceleration from 0 m.p.h. good
b. Acceleration from 50 m.p.h. good

10. What is the most satisfactory cruising speed of your Chevrolet? 45 m.p.h.
11. Reasons for buying a Chevrolet: an inexpensive car to operate and it is low priced to buy

12. If you own or have tried Chevrolet's power steering, do you feel it is a worthwhile and practical extra?

13. Would you prefer a V 8 engine rather than the in-line 6-cylinder unit Chevrolet now has?
Yes ☐ No ☒ Comment: prefer overhead valves - economy more important than extra power

MOST COMMON REASON FOR BUYING

NEW YORK BAKER

14. Rate these points:

Visibility, forward:	Like <input checked="" type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input type="checkbox"/>
Visibility, rear:	Like <input checked="" type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input type="checkbox"/>
Riding qualities:	Like <input type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input type="checkbox"/>
Horsepower output:	Like <input type="checkbox"/>	Acceptable <input checked="" type="checkbox"/>	Dislike <input type="checkbox"/>
Exterior body styling:	Like <input type="checkbox"/>	Acceptable <input checked="" type="checkbox"/>	Dislike <input type="checkbox"/>
Interior body styling:	Like <input checked="" type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input type="checkbox"/>
Automatic choke:	Like <input checked="" type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input type="checkbox"/>
Ignition-key starting:	Like <input checked="" type="checkbox"/>	Acceptable <input type="checkbox"/>	Dislike <input type="checkbox"/>

15. Specifically, what are your complaints? Poor location of rear-view mirror on dash - Don't like crank handle on ventilator windows. Should go back to old style. Noisy Engine Tappets!

16. Have you ever owned a Chevrolet before? Yes ☒ No ☐ How many? 7

17. Would you buy another Chevrolet? Yes ☐ Possibly ☒ No ☐

18. How is your dealer service? Excellent ☒ Good ☐ Average ☐ Poor ☐

19. An overall rating of your Chevrolet: Excellent ☐ Good ☒ Average ☐ Poor ☐

20. What improvements do you want in your next car? V 8 engine - More radical body change than was made from 1952 to 1953

MILTON, MASS., SALESMAN

MANY OWNERS WANT V8 ENGINES

24% HAVE OWNED 5 OR MORE CHEVROLETS

After you have filled out the questionnaire, write additional comments here:
I like operation and performance. Very good except for the noisy motor. Also exceptional top speed and roadability. Braking action not best at very high speeds. Interiors are nicest Chevrolet has ever put out

LONGVIEW, TEX., OFFICE MANAGER

92% OF OWNERS AGREE

REPORT on the '53 CHEVROLET

The true test of a car begins when the owner takes the wheel. Popular Mechanics sent questionnaires to 1000 Chevrolet owners. Here is what they say

By Floyd Clymer

THERE'S AN OLD SAYING that you can't argue with success and if there is any car that has been successful it is Chevrolet. Right now there are about 10,000,000 Chevrolets in use in the United States. That's over 20 percent of the total car "population."

With that record, you expect to find well-satisfied owners—and you do. Only two percent said they would not buy another Chevrolet. Powerglide-model owners were especially pleased—88 percent of them said definitely that they *would* buy Chevrolet again. Only 10 percent said they *might* buy another Chevie. Owners of hand-shift models were not quite so certain: 75 percent said they *would* buy again while 23 percent stated that they *might*. But in each case only two percent said no Chevrolet next time!

Fixed in the minds of some owners is the idea expressed by a Kingston, Mass., machinist, that Chevrolet is a "poor man's Cadillac" or a "workingman's luxury car," as designated by a San Antonio, Tex., butcher. A Bakersfield, Calif., oilworker said, "I have two high-priced cars but prefer the Chevrolet for rough back-road trails. It handles better and actually is more dependable." Others agreed with a Chicago machinist that it is the "most dependable of all cars" and "its dependability can't be surpassed by anything on the road," as an Evanston, Wyo., locomotive engineer wrote.

One salesman in Charlotte, N. C., said: "I have owned other makes of automobiles, but for all-around appearance, performance and economy, I don't think Chevrolet can be topped. With proper maintenance, it is practically indestructible. I have driven my two previous Chevrolets a total of 116,000 miles without missing a single day's work for repairs of any kind."

Many owners are not as yet sold on the need for power steering on a low-price car, so we asked the question, "Is power steering a worth-while and practical extra for Chevrolet?" Of the owners replying, 63 percent thought not. Along this line a Claymont, Del., motor-club manager wrote: "I do not actually object to power steering, V8 engine, or many other possible luxuries; but these are available, for those who desire them, in larger and more expensive cars. Effort should be made to keep the smaller cars within reach of the average potential customer."

Although only 18 percent of the owners reporting had Powerglide instead of conventional transmission, those who did have it reported favorable acceleration. A New Castle, Del., Naval officer said: "The Powerglide in the '53 Chevrolet is a better mechanism than formerly and the gasoline mileage is decidedly better."

As reported by the owners, Chevrolet's average gasoline mileage for country driving was: Conventional-transmission models, 19.2 miles per gallon; Powerglide

Luxurious styling, as on the Bel Air, sold many owners on Chevrolet. The 1953 hood is longer and higher



purchasing agent wrote that the Two-Ten rides like a truck.

"When as many as three people ride in the rear seat of the Bel Air, rear visibility is very poor with rear-view mirror located on dash."—Casper, Wyo., oil explorer. (This complaint was also made by other owners of the Bel Air hardtop—the only body style with the mirror so located.)

"My Bel Air has had to go back to the dealer too many times to get minor things corrected which should have been taken care of at the factory."—Memphis, Tenn., office manager.

"Dealers and salesmen should be more fair with the public. The GM Car Life Insurance was tacked onto my bill without asking; it seems to be a 'must' with some dealers."—Rego Park, N. Y., postal clerk.

"Poor front-end design which is very noisy and loose on bumps or rough roads. Dealer claims this is typical and he can't correct it."—Barberton, Ohio, personnel manager.

"The paint and paint workmanship could be better."—Mattapan, Mass., foreman.

"The ignition-key starting is unsafe . . . If you don't turn key to lock position you can start car without key . . . Anyone familiar with the unlocked ignition could drive the car off."—New York undertaker.

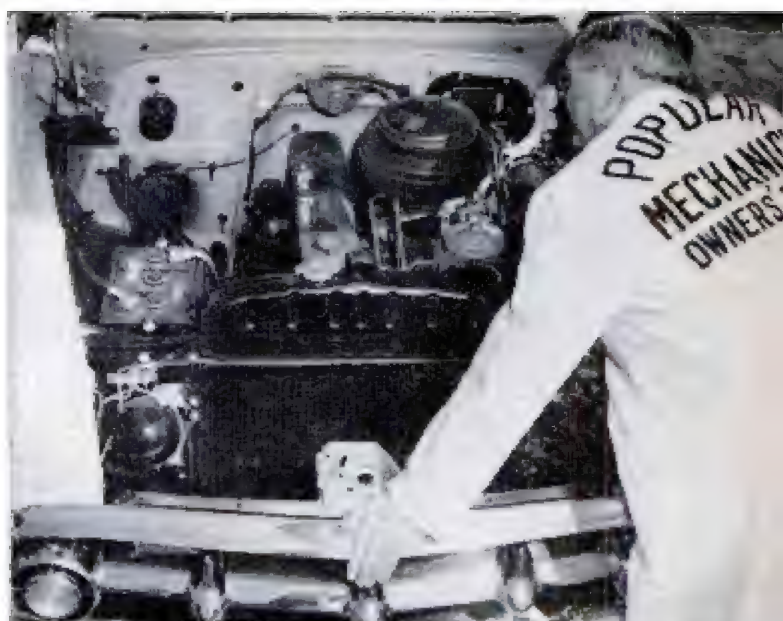
"The key starting is too convenient for my children to play with."—Rapid City, S. D., salesman.

"Is the manufacturer too cheap to put ash trays in the One-Fifty?"—Hollis, N. Y., baker and others.

"The seats do not have enough padding over the springs. When you ride any distance you can feel the springs through the upholstery."—Westfield, Mass., fireman.

Here are some improvements Chevrolet owners want in their next car:

"I think it is time for Chevrolet to make a change. Not necessarily on the body, but mainly on the mechanical features of the car. The '53 Chevrolet seems to me to be a new body put on a 1929 chassis with the shift moved from the floor to the steering



Powerglide models, like the Bel Air Clymer tested, have a 115-horsepower engine with aluminum pistons

column . . . I guess this puts the car on a level with other Detroit products."—Sumter, S. C., draftsman.

"An overdrive unit would be much more practical than power steering."—Van Wert, Ohio, press operator and others.

"I would like to see the right front fender from the driver's seat."—Haddonfield, N. J. tool designer.

"The inside light in the Bel Air should be forward so it would be easier to reach from the front seat. The rear-view mirror should be above the front windshield instead of on the dash."—Hamilton, Ohio, papermaker.

"Built-in (not optional) oil filter . . . static eliminator . . . improved jack for wheel changing . . . right-side rubber crash pads . . . overdrive (not optional) are some improvements wanted by an Oxford, Neb., minister.

"The factory should incorporate more into the One-Fifty—two visors, ash trays, automatic dome light, trunk light, etc."—South Wales, N. Y., airline copilot.

"Specially trained maintenance men are needed to improve the Powerglide."—Seaford, Del., secretary.

Chevrolet doors open wider this year, seal tighter and have the solid feeling characteristic of Fisher bodies





ACCELERATION TEST

1953 CHEVROLET BEL-AIR 4-DOOR SEDAN
WITH POWERGLIDE

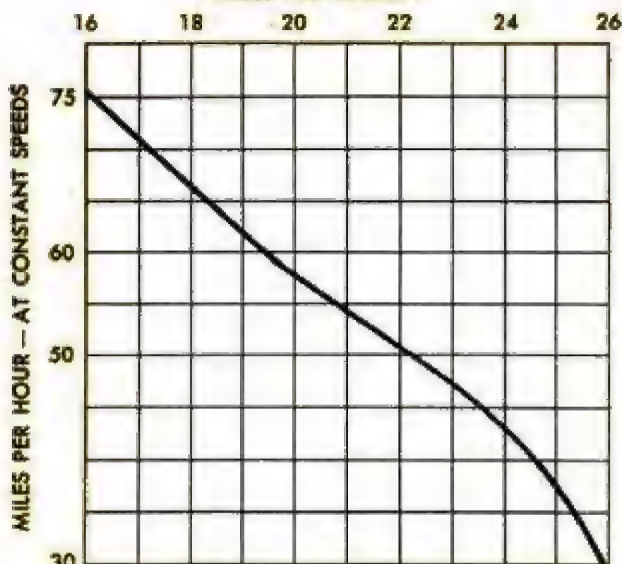
¼ mile from zero	22.6 sec. 21.9 sec.	(Drive only) (Low and Drive)
½ mile from zero	34.8 sec.	(Drive only)
0 to 30 m.p.h.	6.1 sec.	(Drive only)
0 to 60 m.p.h.	20.4 sec. 19.6 sec.	(Drive only) (Low and Drive)

(In tests using both Low and Drive
shift was made at about 30 m.p.h.)

Top speed (by speedometer).....94-96 m.p.h.
Actual top speed about 6% less (speedometer variation)

ECONOMY TEST

MILES PER GALLON



Constant-Speed Mileage

At constant 30 m.p.h.	25.8 m.p.g.
At constant 50 m.p.h.	22.3 m.p.g.
At constant 60 m.p.h.	19.4 m.p.g.
At constant 75 m.p.h.	16.1 m.p.g.

Cross-Country Mileage

Los Angeles to Las Vegas, Nev. (considerable traffic)	18.9 m.p.g.
Los Vegas to Needles, Calif.	20.3 m.p.g.
Needles to Los Angeles	21.7 m.p.g.

(Regular gasoline used to Needles, pre-
mium gas in returning to Los Angeles)

Like many cars today, Chevrolet has a blind spot on right turns caused by a low-hanging rear-view mirror

An Ithaca, N. Y., accountant sent an itemized list of his repair bill after three years of driving a 1950 Chevrolet. One battery, two sets of tires, three sets of spark plugs, one brake-relining job and one voltage regulator amounted to \$225. That was why he bought a 1953 Two-Ten.

"The added weight seems to improve the roadability as well as the riding comfort." —Pulaski, N. Y., fender repairman.

"I have owned four other cars in the last 10 years and this is the first one that has not leaked water when it was washed or when it rains." —Shelby, Ohio, insurance official.

"The new Powerglide is much better for getaway and on the hills than the previous unit. Power steering is fine even on a light car. Roadability and handling is excellent." —a Western citrus grower.

"The new body styling is excellent. Interior much improved over previous Chevrolets." —High Point, N. C., grocer.

"I like the idea of a larger engine turning over more slowly. But I am unhappy with trim that has to have such continuous care —the poor-quality chrome. The outside appearance is not as well balanced as in the previous design, though it is satisfactory." —Asheville, N. C., theological student.

A LaGrange, Tex., farmer's questionnaire furnished puzzlement for all. Asked if he liked 11 separate features of the new Chevrolet, he said every one was excellent, and his over-all rating of the Two-Ten was "excellent." "Would you buy another Chevrolet?" Answer: "No."

And now for my own test: The test Chevrolet was a 1953 Bel Air four-door sedan equipped with Powerglide transmission. Starting at Los Angeles, the test route was via Angeles Crest Highway through the Mojave Desert and Bakersfield to San Luis Obispo and returning by way of the Coast

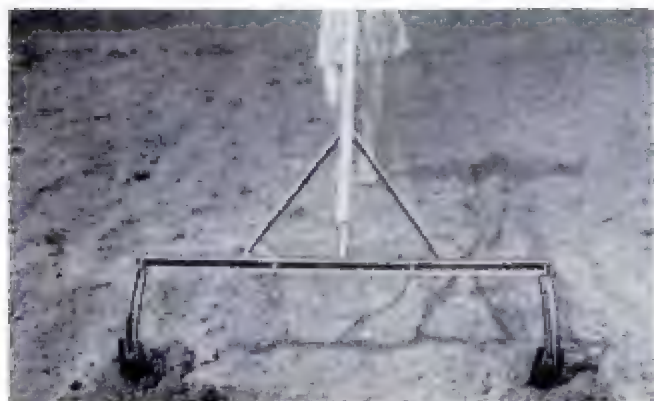
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"Cowtoons" Enliven Walls of Dairy Barn

About the last place you'd expect to find wall murals would be in a dairy barn, but in the 25-cow barn of W. H. Waltner, Hurley, S.D., there's a whole gallery of humorous art. A dainty heifer and an imposing bull caution visitors against smoking, are shown conferring about the serious problems of milk production, or returning from

a gala but exhausting evening at the livestock show. The murals were painted on insulation board which was sealed with two coats of white enamel. Silhouettes of the figures were cut out of newspapers and used as patterns to trace the outlines on the walls. Features were then sketched into the outlines and colored with enamels.



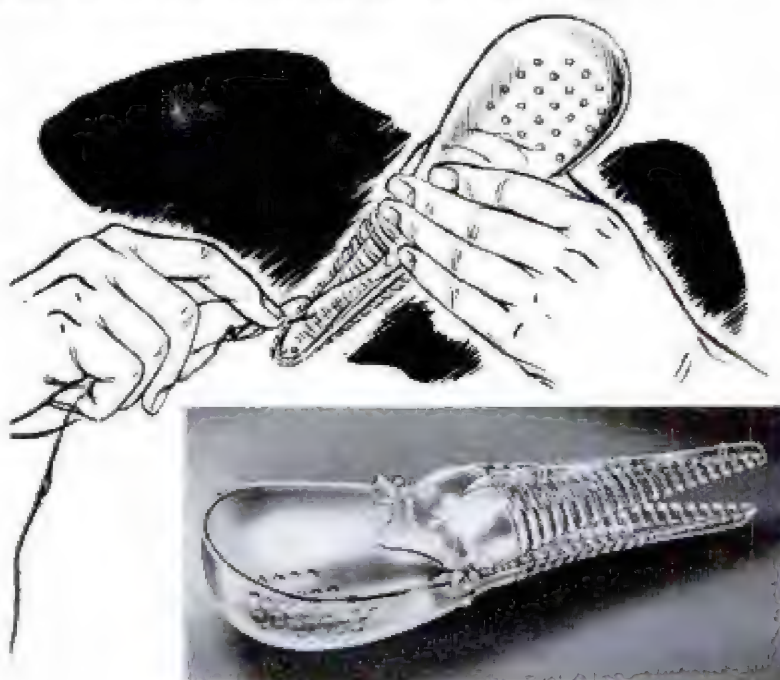
Double-Bladed Hoe Makes Even Rows

Hoeing a garden preparatory to planting is simplified by a double-bladed cultivator that digs rows at regular intervals. String and stakes are used for the initial row only. Spacing of adjacent rows is accomplished in one operation by adjusting the blades to plow at various distances apart. You simply guide one blade along the row just completed and the other digs the next one.

Plastic Scoop Catches and Holds Minnows in Place for Baiting

With a new plastic scoop the fisherman can select a minnow from his bait bucket and install the hook through any part of the body without touching the little fish with his hands. The large end of the scoop is used to catch the desired minnow, which wriggles on down the handle until it is firmly held in the small end. The hook then is inserted as desired through slots in the plastic. The minnow is released by opening two hinged sections of the scoop.

¶The world's most powerful cancer-fighting X-ray machine, a 70,000,000-volt medical synchrotron, has gone into operation at the University of California School of Medicine.



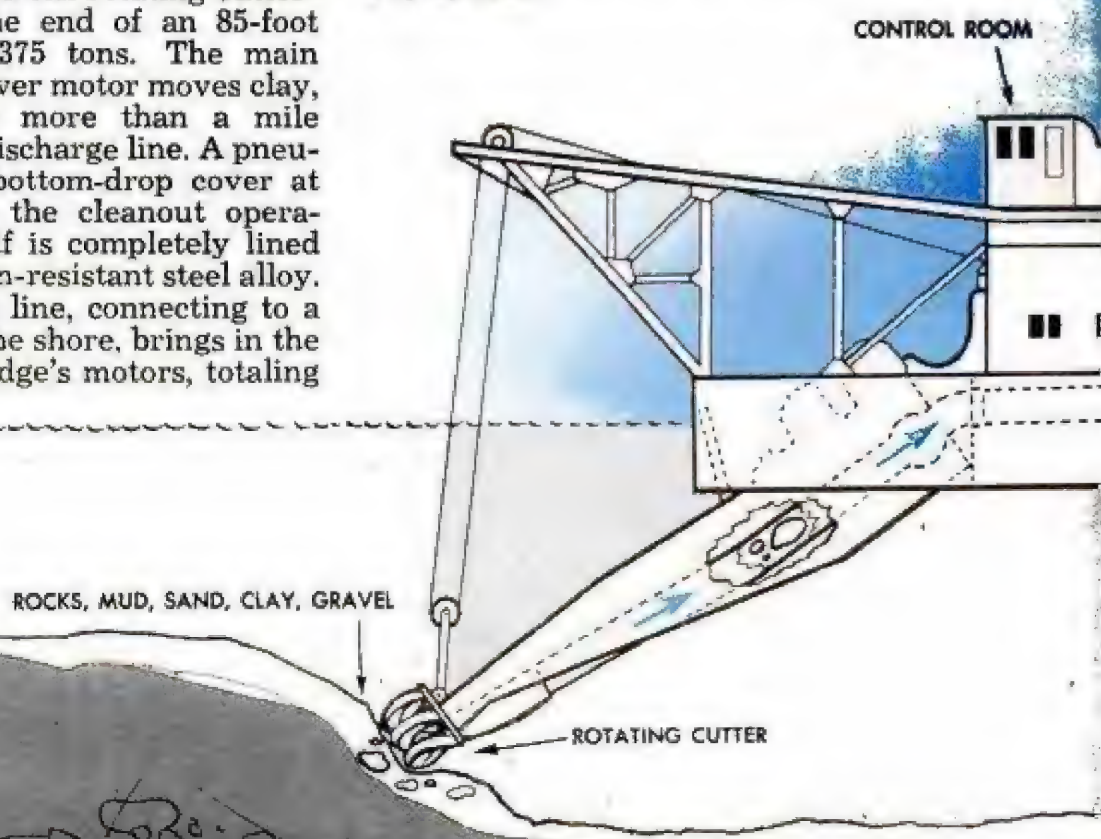


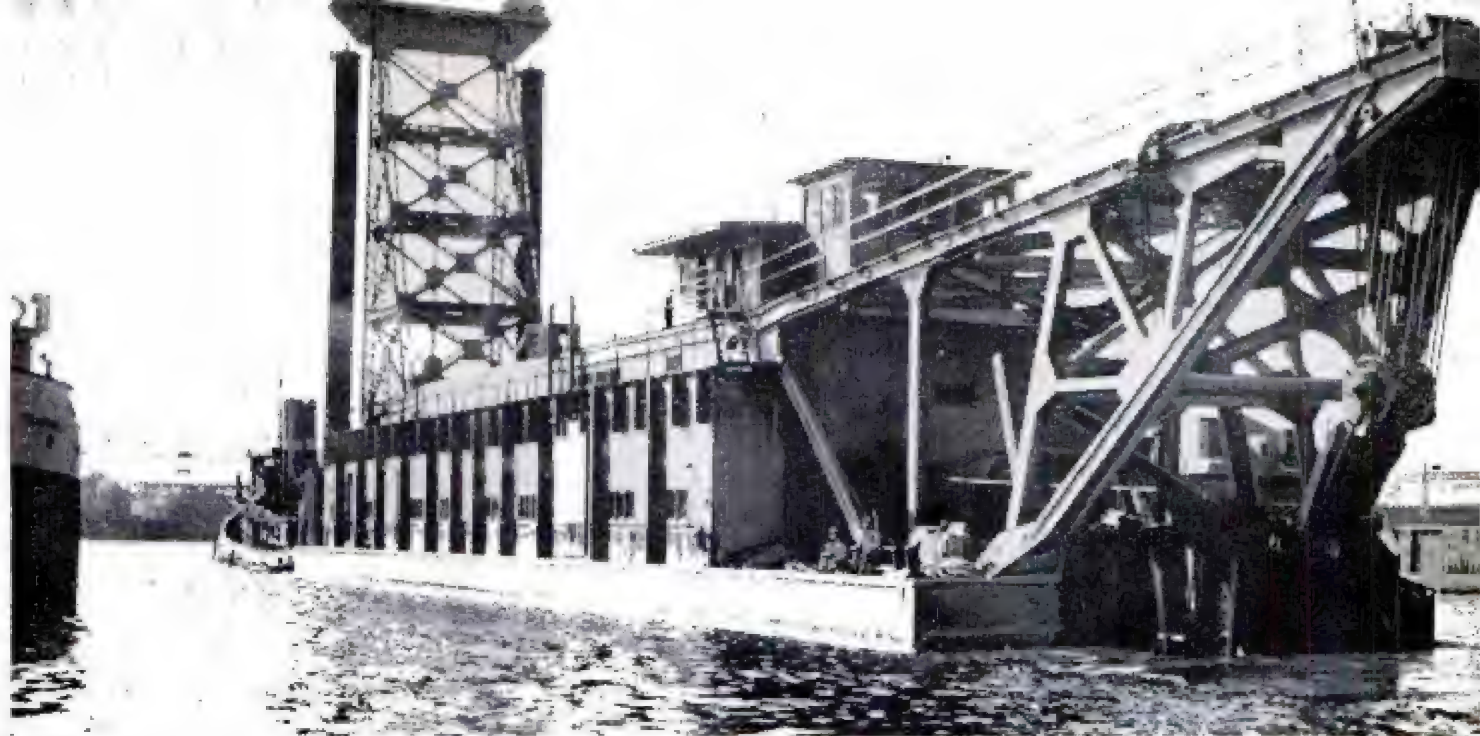
Boulders, clay, water can be carried over a mile in this dredge's discharge line, which is 36 inches in diameter

Giant Boulders Are Pushed Through Mile-Long Pipe

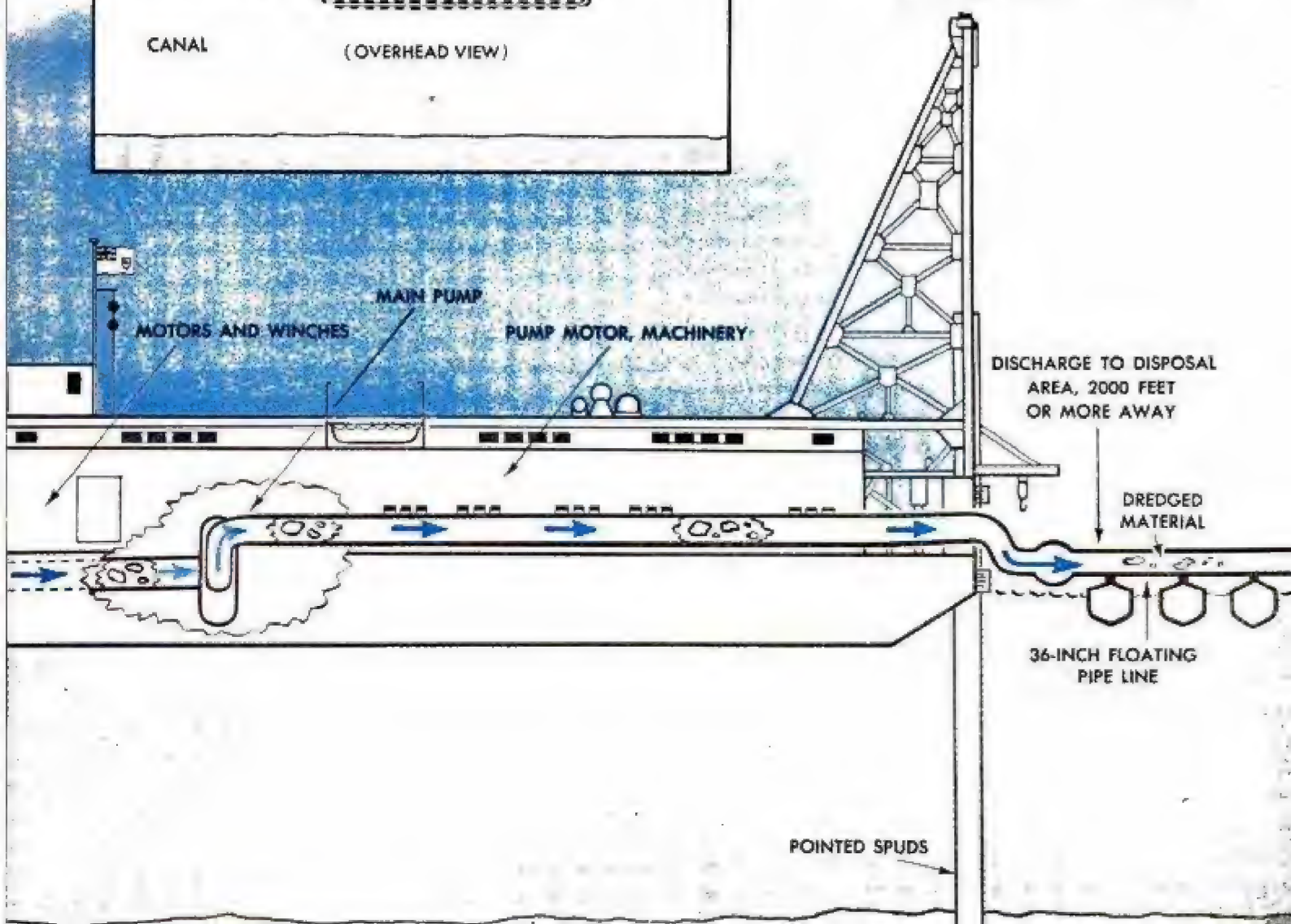
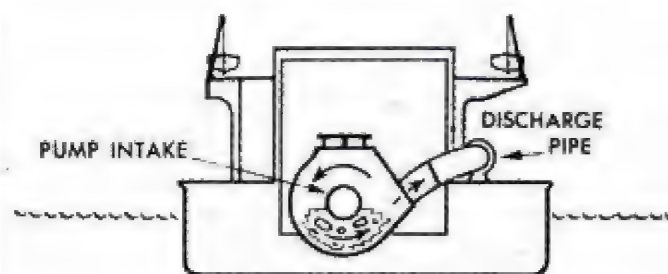
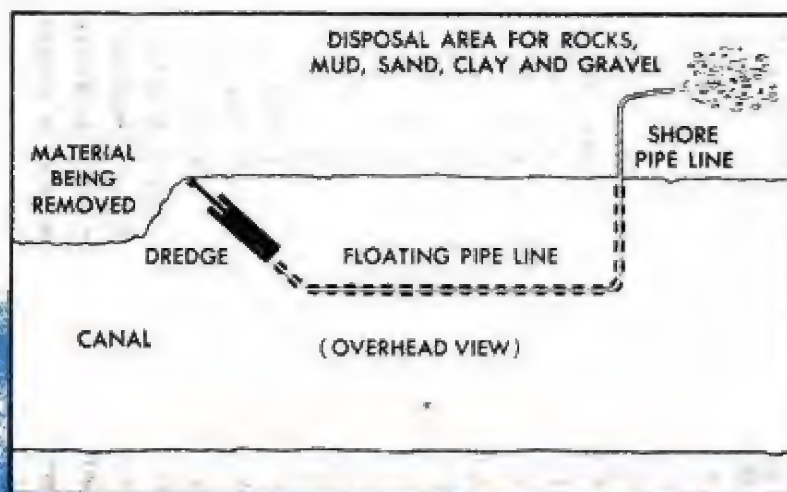
BOULDERS weighing as much as 1000 pounds and measuring up to 30 inches in diameter are being sucked through the giant new dredge that is widening and deepening Canada's Beauharnois Canal. Its designers, the Ellicott Machinery Company of Baltimore, Md., describe it as the world's largest hydraulic pipe-line dredge. The complete unit "walks" itself around its work area on pointed spuds, making it completely independent of other craft. At its working end is a 26-ton rotating cutter-head, mounted at the end of an 85-foot ladder that weighs 375 tons. The main pump's 8000-horsepower motor moves clay, boulders and water more than a mile through the 36-inch discharge line. A pneumatically operated, bottom-drop cover at the pump simplifies the cleanout operation. The pump itself is completely lined with a special abrasion-resistant steel alloy. A trailing submarine line, connecting to a transmission line at the shore, brings in the power for all the dredge's motors, totaling

12,800 horsepower. The hull is 220 feet long, 58 feet across the beam, and the removal of side sponsons narrows it to 42 feet for passage through locks. An estimated 40,000,000 cubic yards of boulder clay will be removed from the 15-mile canal, which is being enlarged to provide more water for the 2,000,000-horsepower Beauharnois hydroelectric plant. Provision has been made to install locks which will make the canal a link in the proposed St. Lawrence waterway system. ★ ★ ★





Seen here from the front, the *Hydro-Quebec* is 280 feet long, 58 feet wide and can dig to a depth of 50 feet





An experienced mountain climber at 16, the boy had slipped on the hard-packed snow. Rescuers hiked and climbed all night to reach him—and found him dead. Their leader came back determined it should not happen again. The result—a college course in

MOUNTAIN

IT WAS DAYBREAK before the volunteer rescue group reached the ledge below the snowfield where the accident had occurred. They found the victim—dead.

About noon the day before, word had reached the leader that one of the boys in a hiking party had been injured. He quickly called several men who knew that section of the Olympic Mountains and they started for the area. All night they had traveled, first along the trail, then across the rough terrain. About midnight a few flakes of snow sifted down. They kept on, not stopping to rest. It was a race against time.

The party wondered why this 16-year-old boy, an experienced climber, had decided to take that short cut across the snowfield where he'd slipped to his death. Whose fault was it that the life of this young man had been taken? Why had he not been warned of the dangers of this hard summer snowfield?

As dawn seeped through the rugged hills, the rescue party, still numb with shock, faced the problem of carrying out the body. If only this young lad had been properly instructed in mountain climbing!

I was the leader of that rescue group, and I made a vow to myself at that time: "If I ever get a chance, I will try, in some way, to teach young people who love the mountains as I do to hike and climb in safety."

Since that morning five years ago, Olym-

It's a mighty long way to solid footing! An advanced student has thrill of descending a wall en rappel



Hungry students dig out their dinner, dropped from a plane after they had stamped out FOOD in the snow

RESCUE AND SURVIVAL

By George W. Martin

Registrar, Olympic College

pic College, located in Bremerton, Wash., has conducted a number of classes in hiking and climbing. I've had the stimulating experience of leading some of these groups. With many scientifically trained as well as experienced mountaineers in the district, the time has arrived when I am able to keep the vow I made that cold morning, years ago. A number of advanced students have formed a class in Rescue and Survival.

The assistant instructor is Chuck Maiden, an experienced climber who has also worked with the more elementary classes in mountaineering. The class in Rescue and Survival is open to men 16 years of age and older who have completed the Olympic College advanced-climbing classes or their equivalent. All nine of the men enrolled in the first class also had considerable climbing experience and even more enthusiasm. The material to be taken up was organized into two sections, with lectures and field trips in each.

In the lectures on rescue, every effort was made to give additional information which would help in case of an emergency. Ome Daiber, vice-president of the Mountain Rescue Council, and Dr. Otto Trott, physician for the council as well as for the Northwest Ski Patrol—both veterans of many emergency trips—shared their experiences with class members by means of illustrated lectures and discussion, emphasizing informally many phases of mountain rescue and safety. These experts covered such subjects as location of the accident, air reconnaissance, first aid, emergency treatment and care of the patient at the scene. Discussed, too, with illustrations, was the task of transporting a victim over all types of terrain. In addition to

Here's the glory of mountain climbing—standing on top of the world. Boys conquer a mountain pinnacle





Photos from Molly Jo Vena

Stretcher recently developed for mountain rescues can be disassembled and packed by two men. Called the Stokeski, stretcher rolls across the ground on a single bicycle-type wheel (below) or moves across snow on a ski. Photo on opposite page shows how unit is used to rescue injured man from a deep glacial crevasse

emergency and standard stretchers, the new Stokeski type stretcher was demonstrated. Other local men were called in, several with experience in rescue and survival units of the armed services. Bill Juneau, experienced Scout leader, explained the problems of lowland rescue.

Field trips were planned to give each member of the class as much experience as possible in locating and transporting victims under actual conditions. Ten minutes before one group was to leave for a trial rescue, Chuck Maiden went into the woods to take the part of an injured person. The class tramped unsuccessfully through the

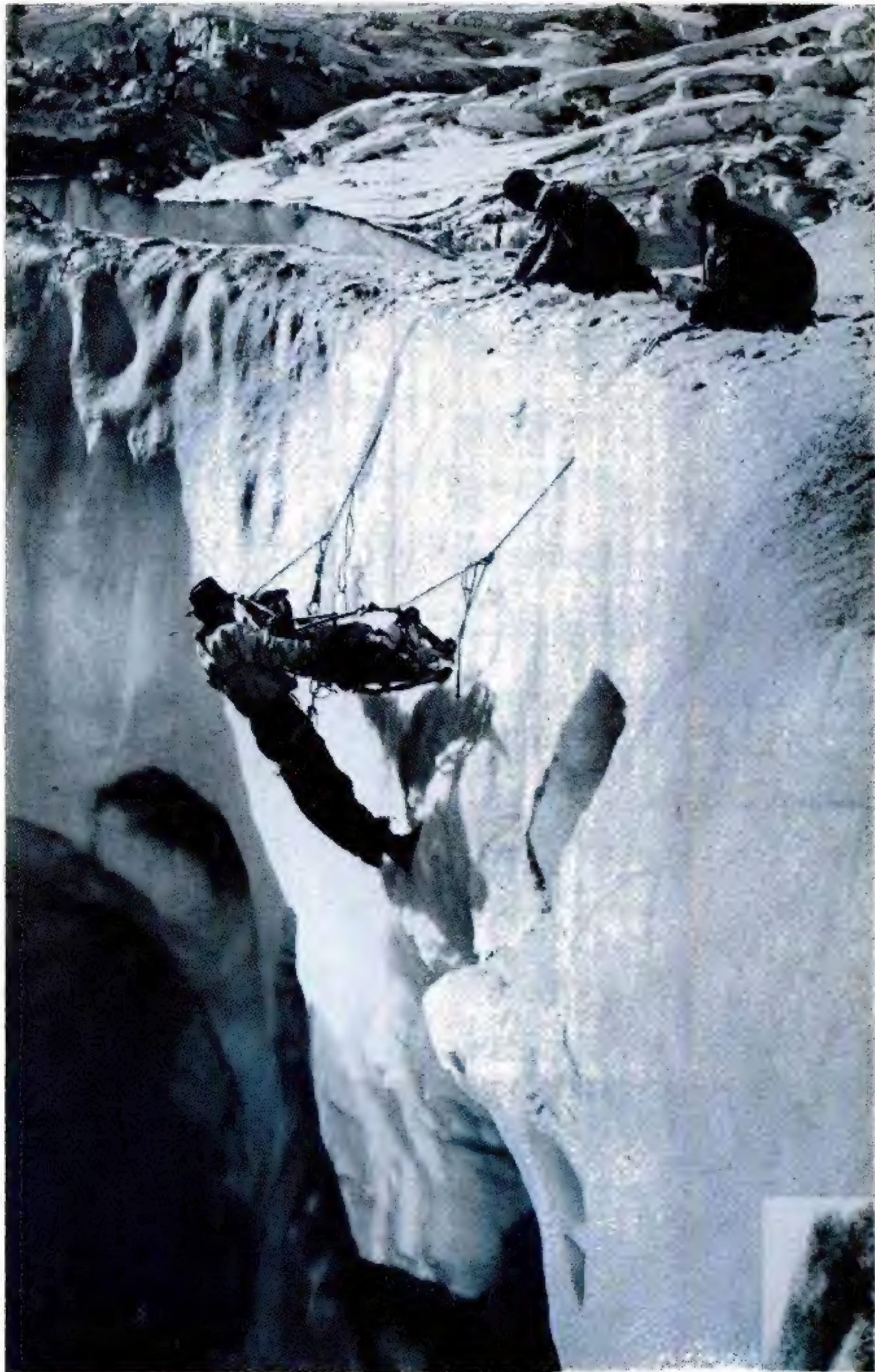
uplands near Green Mountain for an hour. Looking over the section carefully and later lining up and sweeping the area in all directions, they still could not find him. A small noise brought a student hurrying to a little open spot near a log. Two members had passed a few feet from Maiden without seeing him. Through this practical test, the instructors and the class knew that more training in this phase of the work definitely was necessary.

A second field trip in rescue found the class high on the side of Mount Eleanor in the Olympic Mountains. The "victim" this time was supposed to have a compound fracture of the right leg and dislocation of the left shoulder. Carefully improvising splints and bandages for the patient, the class put him on a folding stretcher.

The test this time was the grueling one of carrying out an "injured" person over three miles of rough terrain and narrow mountain trails. For even greater variety in carrying and more experience in splinting, the patient in the stretcher was changed every half hour.

The last half of the course was devoted to survival. The lectures stressed proper procedures under extremely trying conditions. Robert Scott, the regional botanist, discussed location and preparation of many natural foods in the primal Olympic Mountain area. He explained the importance of using food at hand: Berries, nuts, seeds, wild onions, water cress, sheep sorrel, butternut root, cattail root, tender fern shoots and avalanche-lily bulbs. In winter, the inner bark of certain trees, as well as tender buds and shoots of trees like vine maple could be used as food. There was a panel







Students of Rescue and Survival course absorb expert instruction in crossing rugged crevasse on Mt. Olympus

discussion on locating water and shelter, snaring animals and birds, fishing, improvising clothing and signaling.

The field trips tested the ingenuity and endurance of the members of the class. A three-day trip through a rugged part of the Olympics gave initial experience under survival conditions. We discussed a survival field trip with E. Jenks Beard, Wing Commander of the local Civil Air Squadron, and agreed to make the venture a joint operation between the Civil Air Patrol and Olympic College.

The operation called for two planes to conduct the search. The first plane would be flown by Commander Beard with Bob Armstrong as an observer. Since Jim Wilson was the winner of the local aerial-bombing contest, he was selected to take the second plane. With him was Bob Hatch, photographer for the Civil Air Patrol. They carried the carefully packed box of food for the hungry hikers. The plan was to drop the food to them on the high ridge between the headwaters of the Skokomish and the Duckabush rivers.

Making the trip the last week end in November, the class found snow already deep in the high ridges. The men started out with individual rations for each meal, consisting of one piece of Ry-Krisp, four ounces of cheese or dried meat and one candy bar.

After a rough 11-mile trip, the group camped as planned at Home Sweet Home

(Continued to page 224)

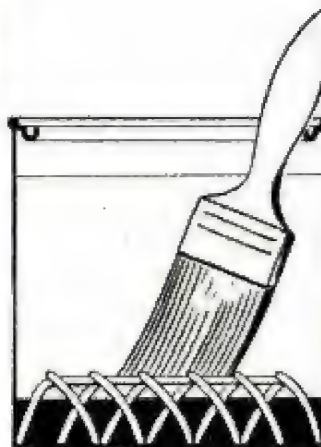
Expert mountaineers later, students are shaky as they begin climbing Monitor Rock, manmade Seattle mountain





Room Air Conditioner

Year-around air conditioning is furnished by a compact unit that fits permanently into a window opening. A heating element provides the extra warmth that's needed in spring and fall, and supplements the regular furnace in winter. Refrigeration coils cool and dehumidify the air in summer. The control panel mounts knobs for maximum cooling, night cooling, ventilating, heating, exhausting stale air and extra dehumidifying.



Brush-Cleaning Can Has Built-In Paint Trap

Inside every can of a new brush cleaner is a grilled surface that not only helps clean the bristles but also prevents the brush from touching the paint particles on the bottom. The cleaning liquid is nonflammable and can be used to cut through paint, varnish, lacquer or shellac. The brush is soaked in the liquid, then worked across the grilled surface. When the paint in the bristles has been emulsified, it is washed away by rinsing under a water faucet. Paintbrushes that have become hard can be reconditioned by soaking overnight.

Golf-Practice Machine Keeps Accurate Tab on Player's Swing

Distance, direction and every shot's degree of loft are shown by a new golf machine, for backyard or indoor use. The player hits a regulation golf ball, attached to a 640-pound-test nylon cord anchored to the machine. The tethered ball is hit from a rubber mat placed behind the machine. After the ball has been hit, the calibrated shaft to which it is attached is extended forward and the reading on it indicates the distance the ball would have traveled. A loft gauge, controlled by the shaft's angle, registers the degree of loft the ball would have taken and another indicator pin-points its direction. An area 20 feet square is sufficient for installation of the machine. Two spikes hold the main unit in place when it is installed outdoors, and indoors it can be fastened down with bolts or screws.



Information not listed on articles in the index often is listed in the WHERE-TO-FIND-IT LIST, available at no cost from the Bureau of Information, *Popular Mechanics*, 200 E. Ontario, Chicago 11



WHAT'S NEW FOR

Your Home

1. COLOR PRINTS made from your favorite color transparencies are enlarged to 40 by 60-inch size for use in home decoration. A new process is said to reproduce faithfully the complicated color patterns of mountain, ocean and forest scenes. A variety of ready-made full-color prints is also available

2. ONE-CUP COFFEEMAKER sits right in the cup—there's no pot to wash. A spoonful of drip-grind coffee is placed in the little coffeemaker, the strainer inserted, and boiling water added. In practically no time at all, you have a cup of coffee brewed exactly to your taste. Coffee waste is ended



3. CANISTER dispenses coffee, flour and sugar into little drawer scoops at base of container to end measuring mess. Finger levers release coffee and sugar; a crank is turned to sift the flour as it is dispensed from large middle bin. In addition to a hinged over-all lid, side bins have separate covers

4. MULTIPLE KNIFE with nine parallel blades cuts 10 even slices at once of tomato, butter, beet, pickle, cheese, boiled potato, egg and many other foods. The saw-tooth blades are made of stainless steel, can't rust. Measuring 7 1/4 inches long, the tool is lightweight, has an easy-to-grip handle

5. ANTISPATTER frying-pan lid is perforated to allow steam to escape, but keeps flying grease inside pan, eliminating hazard to housewife. Two sections of lid are easily taken apart for cleaning. Since moisture is released but grease can't pop through perforations, food is unusually dry and crisp





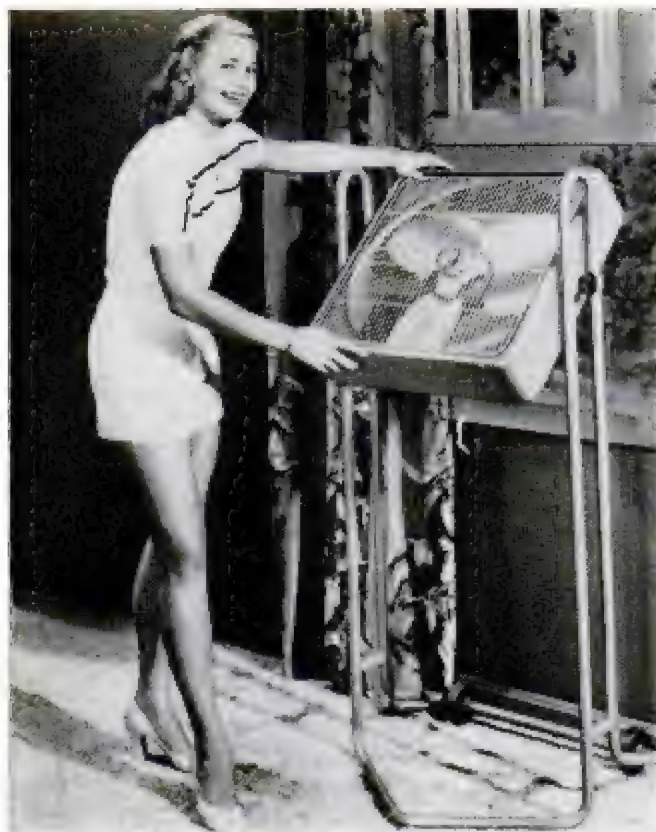
6. WIRE BASKET serves as decorative cover for household flowerpots. Made of sturdy, decorative, expanded metal, the covers are rust-resistant and finished in baked enamel. Three sizes, for pots from 4½ to 8 inches in diameter, and two colors are available. Built-in saucers catch watering overflow

7. DISH WASHER fastens to any sink sprayer and releases detergent suds as it is rubbed over dishes. No tools or fasteners are needed to attach the rubber device to the sprayer hose—no moving parts are involved and the faucet is left free for rinsing. Liquid detergent is dispensed from special cavity

8. CONVERTIBLE GRINDER can be changed from a meat grinder to a device for producing noodles in less than a minute. Made in Germany, it is equipped with four disks for broad noodles, half macaroni, fine noodles and large soup noodles. High pressure on dough assures firmness. Device is easily cleaned

9. WATER PURIFIER keeps steam irons free of damaging scale by removing minerals from tap water. A replaceable resin filter purifies enough water for a three to six-month supply, changes color when it needs replacing. In a few minutes, it will convert all the water needed for several hours of ironing





Fan Rolls Between Rooms

Mounted on a tubular stand, a new 20-inch cooling fan can be rolled from room to room. The fan slips up and down on the stand so it can be adjusted to the level of any window. It also can be removed from the stand and placed on the floor or a table. The blade can be tilted to any desired angle. For quiet operation, the three-speed motor has a hub mounted in rubber.



Portable Barbecue Has Asbestos Wick

Amateur chefs can set up a new portable barbecue either inside or outside the house. The cone-shaped unit can be used in a fireplace by assembling it in its "low" or 16-inch position. Outside it is set up in its 24-inch position to provide a higher cooking surface. The barbecue has a firebox near the base of the cone and utilizes the reflected heat from a small amount of charcoal. An asbestos wick at the base is removed, dipped in coal oil or denatured alcohol, reinstalled and ignited with a match, eliminating the need for kindling.

"Sun Dial" Sets Movie-Camera Aperture for Correct Exposure



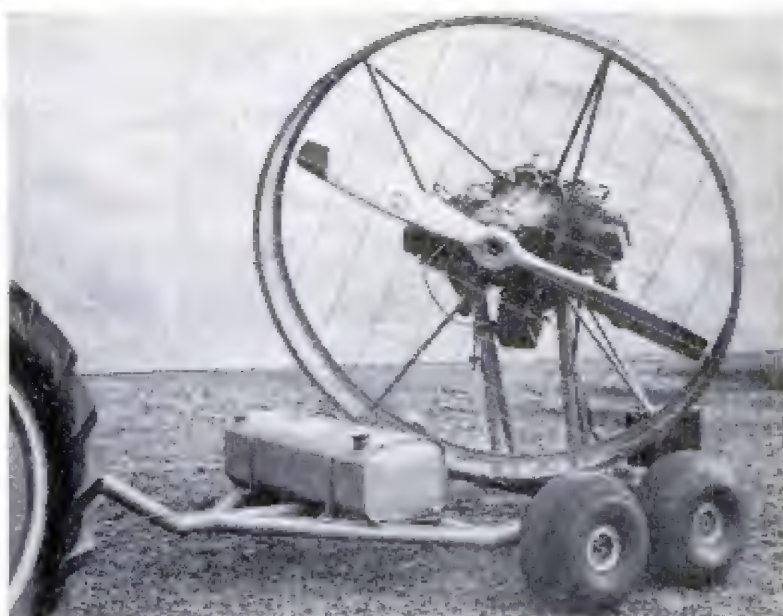
Simplicity of operation is claimed for a low-priced movie camera on which the lens aperture is set by turning a pointer called a "sun dial." The pointer is geared to the aperture control and is matched up with any one of the four markings representing various light conditions. Different pointers are provided for color and for black and white. Another feature of the camera is a large view finder which shows the area to be filmed without reduction in size.

Jets Tested With Synthetic Oil

Air Force jet tests are now being run with a synthetic oil that promises to overcome the high-temperature defects of petroleum types. Developed by Standard Oil, the synthetic uses a base obtained from an unnamed alcohol-acid combination. The new synthetic does not boil as soon as mineral oils, nor does it break down as easily into chemicals that jam the engine works. It operates satisfactorily from minus 65 to a temperature above 450 degrees Fahrenheit.

Tractor-Drawn Propeller Roams Orchards to Dry Cherries

Fruit growers of the Yakima Valley in Washington are using a land-bound "airplane" to dry their cherry orchards. The purpose is to prevent the fruit from splitting, which many growers believe is caused by water standing on the cherries. In recent years, cherry men have rented helicopters to dry their orchards by hovering over them, but the cost of this service runs high. Fred O. Schweitzer, a Yakima airport flight operator, has come up with a portable propeller which is towed behind a tractor. The propeller is mounted on a tubular frame and driven by an 85-horsepower aircraft engine.



Minnow-Keeper Produces "Magic" Bubbles Inside Bait Bucket



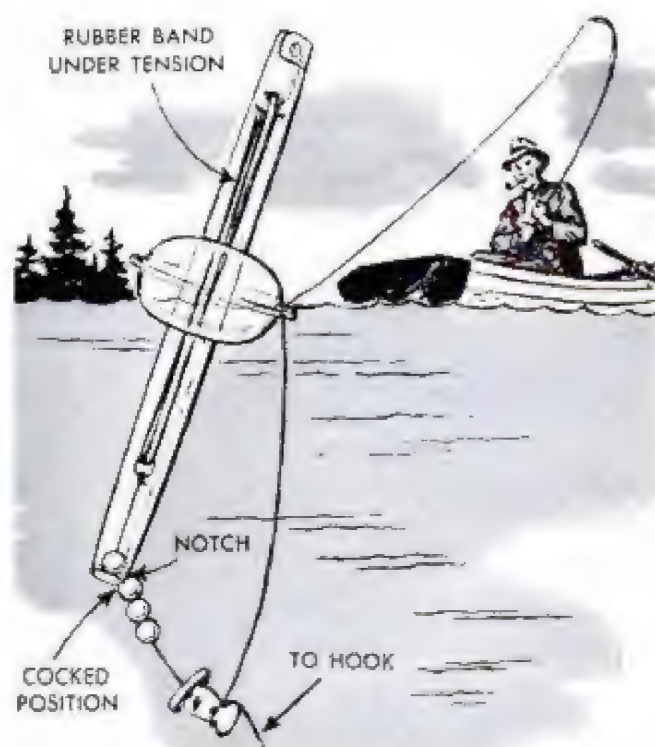
Working on a mysterious principle, a new aerator for bait buckets produces bubbles without an air pump. The aerator permits more minnows to be carried in a bucket for longer periods of time than would otherwise be possible. It consists of a plastic tube connected to a small vibrator. When the tube vibrates rapidly in water, it produces a steady stream of air from its lower tip. Even the manufacturer does not know why the air appears at the tip of the tube, which is inserted through a hole in the top of the bait bucket. The aerator is available with a plug which fits an automobile cigarette lighter or with clips which are fastened to a six-volt battery.

Bobber Sets Hook When Fish Nibbles

At the first nibble of a fish, a mechanical bobber jerks the line to set the hook. The transparent-plastic bobber, which contains a heavy rubber band, is cocked by pulling the line until the band is taut. Then it is fastened in this position with one of four small beads. When the fish nibbles, the bead slips off the bottom edge of the bobber, releasing the rubber band to jerk the line.

Frozen Bread

Frozen bread with fresh-out-of-the-oven flavor will be a staple in millions of American homes within five years, predicts a bakery official. His company recently started distribution of frozen bread all over the nation. The method eliminates the present vast waste of stale bread and enables a housewife to purchase a week's supply and keep it in her freezer.





Aerial view of Wilmington Boat Works shows wooden ships under construction, laminated sections drying

Gone are the great oak-timbered ships like the famed *Constitution*. The biggest piece of oak in our newest mine sweeper is only 16 feet long and less than an inch thick! Now they build

SHIPS OF WOODEN 'SANDWICHES'

STANDING AMIDSHIPS on the deck of the two-thirds completed *Implicit*, the assistant hull superintendent looked down into the hold. On his sunburned face was a look of mingled awe and satisfaction.

"I've been a ship carpenter for 27 years,"

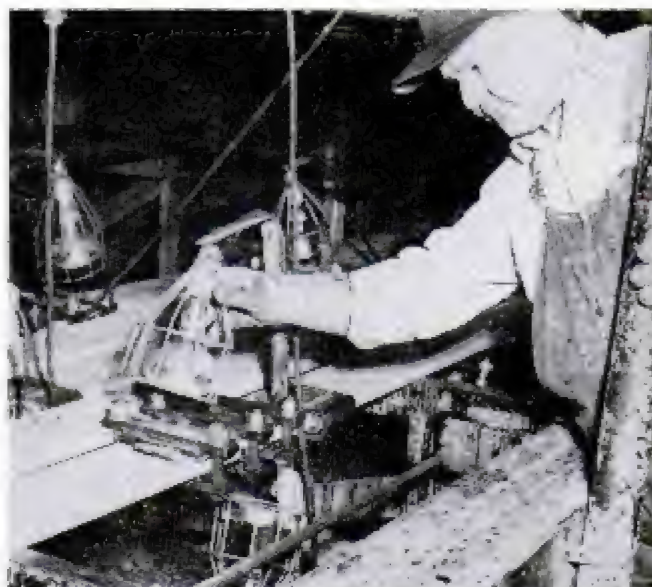
Foreman inspects short pieces of lumber with ends tapered so they may be joined into longer lengths

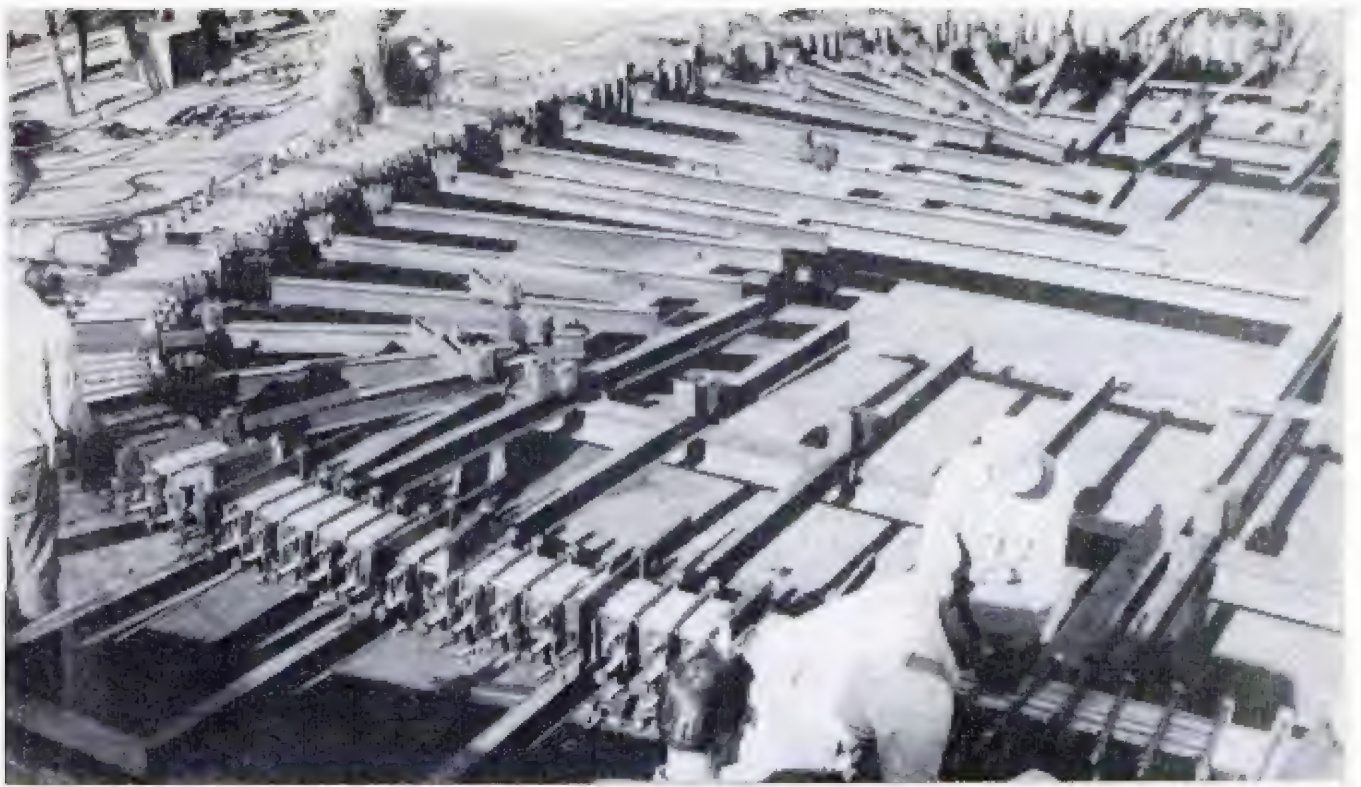


By Bob Ruskau said Frank Argento, "but I've never seen anything just like this. The biggest piece of oak that went into this ship, mind you, was only sixteen feet long and $\frac{7}{8}$ of an inch thick. Two years ago I wouldn't have believed it possible."

Made for mine sweeping, the 171-foot *Im-*

Pieces are glued together and dried by heat lamps placed above and below joints held in pressure clamps





After planing and finishing, the pieced-together lengths are glued into sections bent to shape on big metal jigs

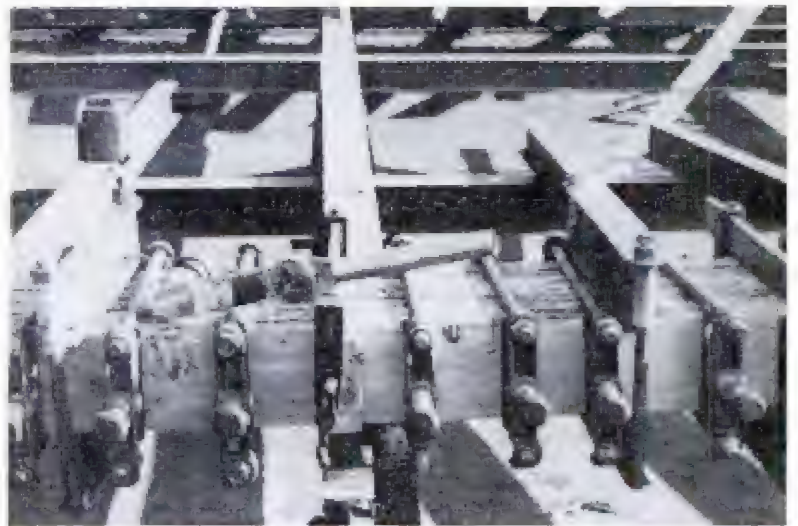
PLICIT was being constructed of laminated woods to an exact and completely new Navy formula. Like her duplicates under construction in 14 yards about the country, she has been called "the finest wooden ship the Navy ever built."

Bob Carlson, president of the Wilmington Boat Works at Los Angeles Harbor where the *Implicit* and seven sister sweeps are now under construction, tells why the "sandwich" ships surpass even the magnificent timbered ships of old.

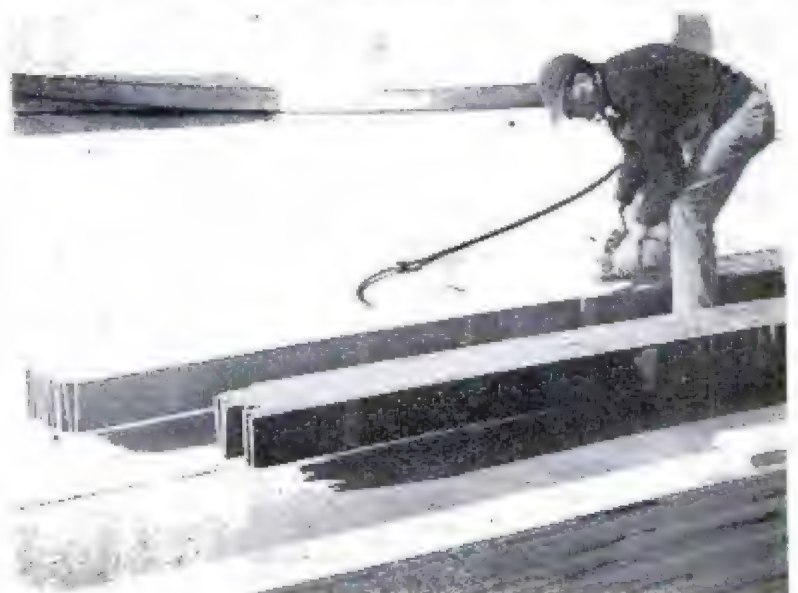
"It has been found almost impossible to cure large timbers completely—so, they eventually will rot in water. It is better to build up thoroughly dried and cured small pieces. Because of our improved techniques of gluing and curing—many developed within the last two years—we can produce far stronger vessels than were ever built of solid woods."

Because this formula has uncovered amazing potentials in laminated-wood construction, many maritime experts envision a return to the era of wooden ships. Great windjammers under canvas? A few, perhaps. But more likely, cargo vessels powered by diesel.

Not even those engaged in the laminating of these woods, however, profess to understand fully the peculiar alchemy by which



Sections are nut-clamped at specific pressure in the jig. Steam blower mounted in mobile structure on tracks is rolled over jig to "cook" sections. Below, cured section is sanded





Ship starts to "come alive" as laminated keel is laid and building of hull begins

the wood achieves a nigh-unbelievable, ironlike hardness and strength.

The tensile strength of a laminated-oak frame, for instance, has proved nearly twice that of a cured oak timber of equal dimensions. In resiliency, the laminated pieces surpass steel.

Primarily, the wood used in building the staunch minesweepers is oak, although fir is used in the deck construction as well as in some of the beams.

When the oak and fir pieces come into the yard they are carefully inspected for such weaknesses as knots, honeycombing and sap. The first main step in the process consists of tapering the ends of each board so it may be combined with others into longer lengths. In the *Implicit*, these lengths, or laminars, are 61½ feet long, this being the length of the vessel's ribs.

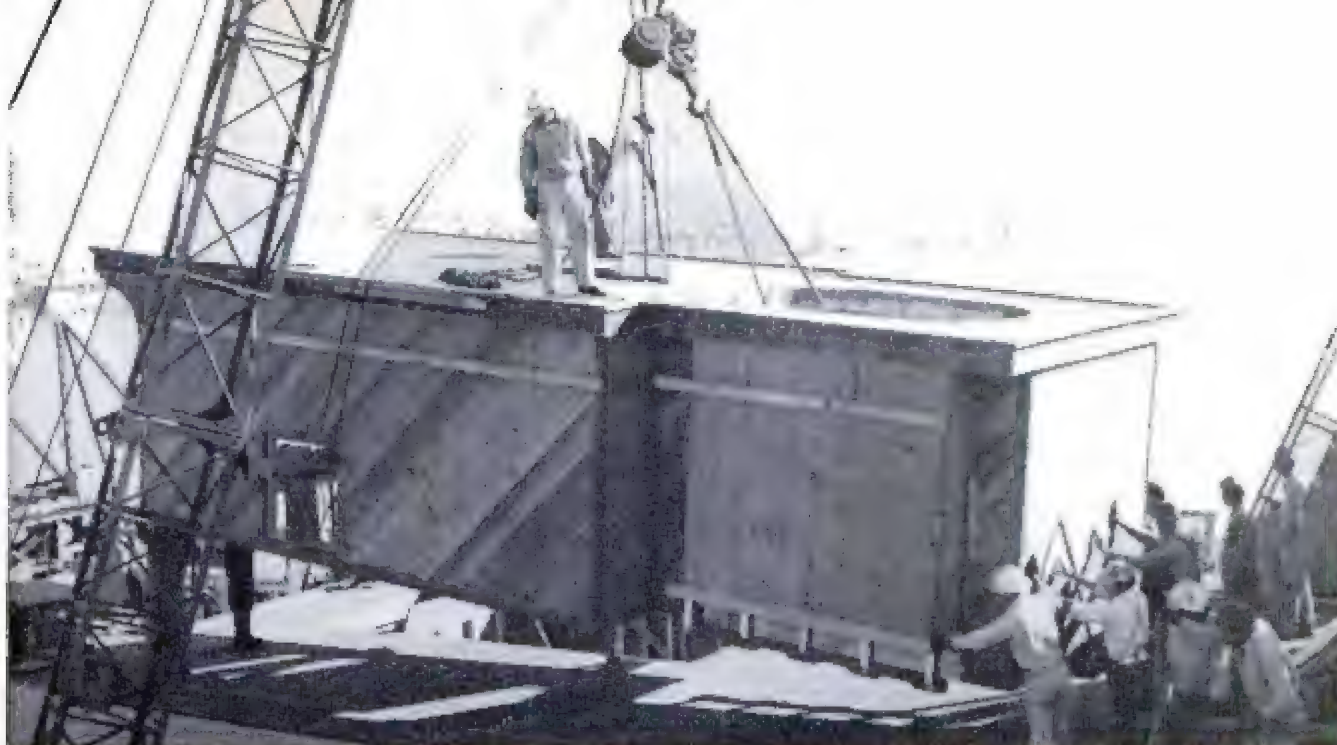
Glued and pressed by nut clamps under 30 pounds of pressure, the laminar is dried on a long table under a battery of heat lamps for half an hour.

The next step carries the lami-



Preassembled transom is fitted to stern. Below, construction scene inside hull as wooden mine sweeper moves to completion





The after deckhouse, also built of laminated pieces, is carefully swung into position on deck of new ship

nars, in turn built up into sections, to a big metal jig on which they are molded to a specified shape, and where the gluing and pressing process is re-enacted on a far larger scale. A mobile, corrugated building seated on wide tracks and housing a steam blower is now pushed atop the jig. For varying periods—usually totaling about 14 hours—the jig-molded, laminated section is subjected to controlled steam heating, followed by cooling.

After rough sanding to remove glue particles, the sections are sawed and finished to

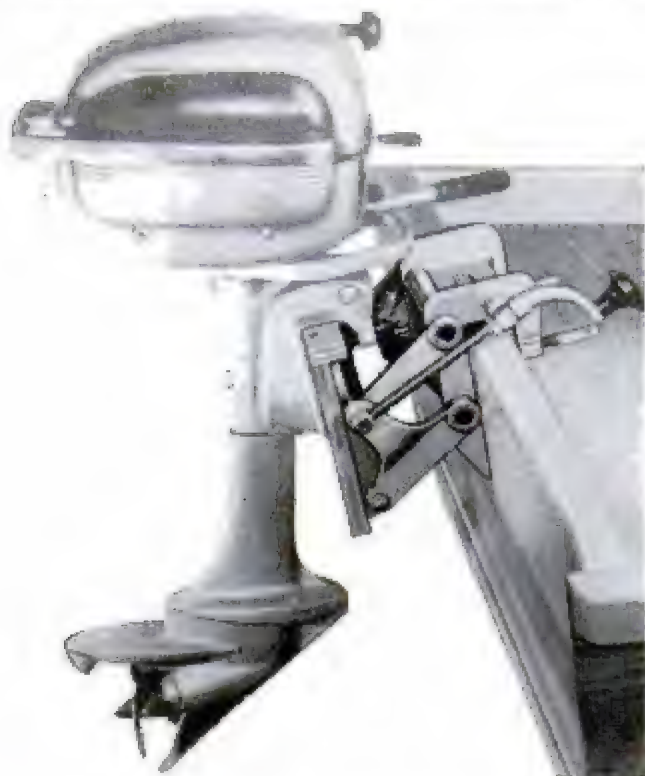
their exact specifications. Every piece carries designation marks and is ready to move into its predetermined place in the hull. The rest is conventional carpentry, though more than 90 percent of the completed ship—keel, stem, frame, decking, even the rudder—is of laminated pieces.

And, while neither magic nor mirrors is employed, ship carpenters, the master craftsmen of yesterday, continue to be amazed at this miracle of converting little ones into big ones to create modern "iron ships of wood." ★ ★ ★

A ship is born. Over 90 percent of the USS *Implicit*, 171-foot Navy mine sweeper, is constructed of laminates



Mount for Outboard Motor Permits Height Adjustment



Clamped to the transom of a small boat, a frame supports the outboard motor and permits it to be raised or lowered a total of seven inches by a screw-adjuster arm. At its highest, the motor propeller is virtually at water-surface level, and at the lowest the propeller is lower than when the motor is mounted directly on the transom. Made of strong, lightweight aluminum alloy, the mounting frame lessens wear on the transom itself and eliminates oil and gasoline drippings in the rear of the boat by holding the motor several inches away from the stern.

Tubeless Airplane Tire

Weight savings up to 125 pounds per airplane, depending on its size, are achieved by using a new tubeless tire designed for main aircraft wheels. Developed by the Firestone Tire and Rubber Company, it has undergone successful landing tests at speeds up to 250 miles per hour.

Watch for Sports-Car Drivers All But Shifts Gears

Sports-car competitors will find a new Swiss watch as handy as an assistant driver. In addition to being a wrist watch and stop watch, it is calibrated to clock speed runs over a measured mile at up to 120 miles per hour. It has three dials to record elapsed driving time up to 12 hours and has a time-out feature for stops. Then there is a unit counter that records gallons of gasoline (up to 60). A push button operates the counter. When not driving, the sports-car fan can use the counter to keep his golf score.



Apartment-Window Cage Protects English Tots

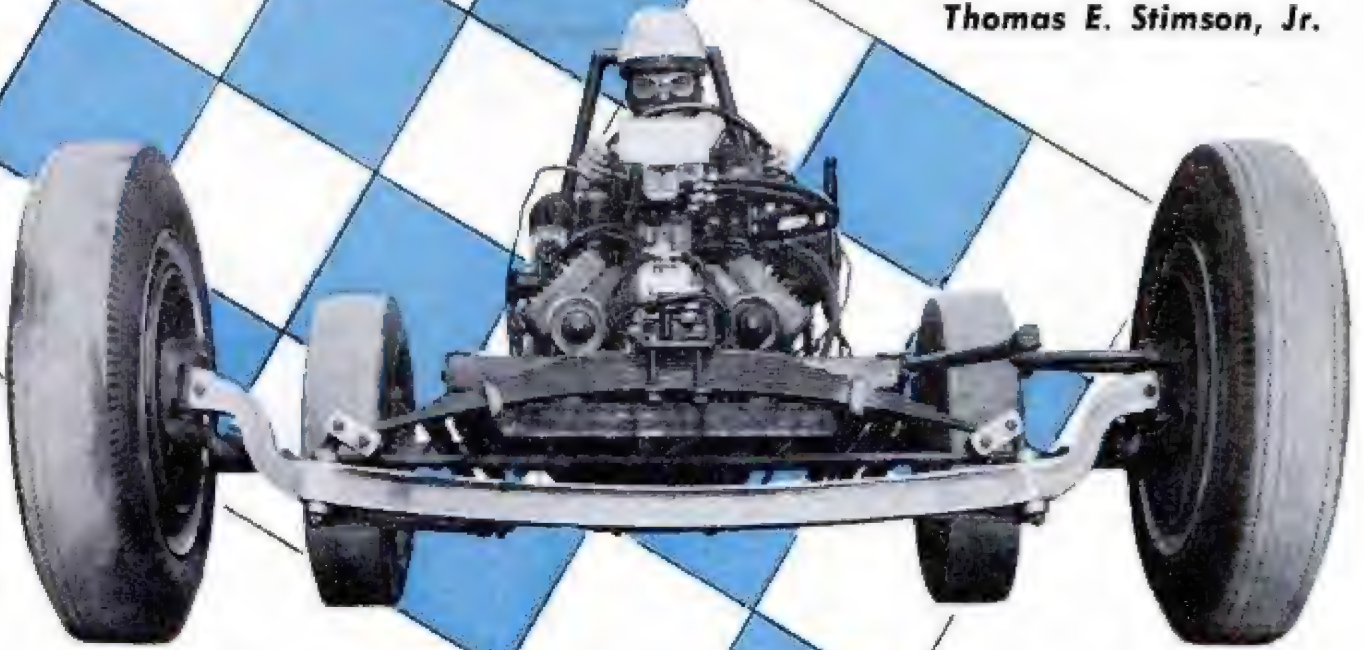
Enclosed in a wire cage suspended from an apartment window, English children play in the sunlight and fresh air while their mothers are busy with housework. The cage, made of wire netting, is strongly braced and is guarded on the apartment side by a cloth net which prevents children from crawling back into the room. Loaned by an infant welfare center to families with no gardens, the portable balcony is apparently popular with children and mothers. The demand exceeds the supply.



Blind students at the University of Pennsylvania study with "textbooks wired for sound"—reels of sound tape on which fellow students have recorded hundreds of pages of lesson material.

Only the essentials are on a specialized acceleration wagon that hits 125 miles per hour in a quarter mile

by
Thomas E. Stimson, Jr.



Lightning Hits the Drag Strip

STREET RACING is not only illegal, it's downright dangerous." That's what C. J. Hart was thinking a few years ago after watching a dozen hot rods convert a lonely stretch of highway into an impromptu race course one midnight.

"Why can't we get a private road or an unused runway at an airport," Hart mused, "and hold these races in the daytime in a safe, legal manner?"

That's how the drag strips were born.

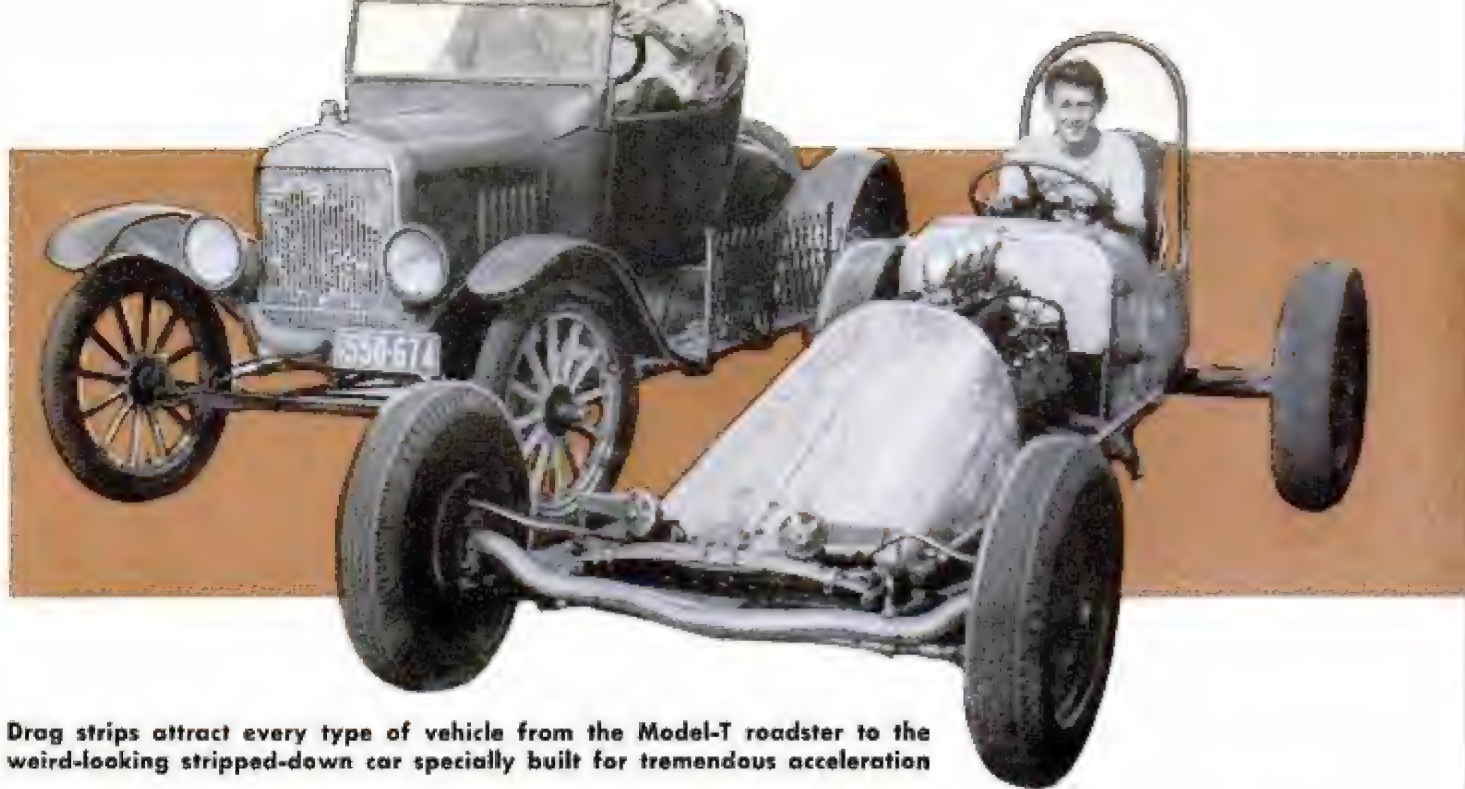
Together with another enthusiast, Hart leased an unused asphalt runway at the Orange County airport near Santa Ana, Calif., and spread the word that on the following Sunday any hot-rod owner or other heavy-footed driver could test his car for wide-open speed. Admission: One dollar for the day. Spectators: Half a dollar each.

The idea was an immediate success and the Santa Ana strip has been operating ever since. On a typical Sunday you'll find upwards of 300 competing vehicles and possibly 2000 spectators lined up along the sides of the straightaway. The first car roars off from the starting line at 10 a.m. and the speed tests continue until dark.

"That last roadster with the supercharged Ranger aircraft engine turned 104.8 miles per hour," the loudspeakers inform the crowd. "Man here with a '52 Olds Rocket challenges any Hudson Hornet present. Any takers? Watch these cycles coming up, folks. Number 52 hopes to break the record today."

Motorcycles, stock cars, hand-built competition cars, anything on wheels can run against time at Santa Ana provided that the vehicles conform to basic safety requirements. Entries on a typical Sunday may include a streamlined scooter with souped-up engine driven by a 10-year-old boy, and a 1923 Model-T Ford whose owner is curious about its speed. Professional mechanics and amateur mechanics use the drag strips to test the effects of various carburetor and timing adjustments on their motors, as well as any improvement in performance that special racing equipment provides.

Mornings at a drag strip are devoted to racing against the clock, one car at a time, with each car going back to the pits for additional tuning between trials. Match



Drag strips attract every type of vehicle from the Model-T roadster to the weird-looking stripped-down car specially built for tremendous acceleration

races between the two fastest cars in each class are held in the afternoon. For the wind up, the fastest car and the fastest motorcycle are pitted against each other. Surprisingly, a fast roadster can accelerate faster than the best motorcycle.

Today there are more than a half dozen drag strips in California alone. There's also a strip at Phoenix, one near Dallas, others near Chicago and Denver. At Akron, the Ohio Cam Jammers use a long straight road along one side of an airport for supervised speed tests. It's estimated that there are more than 30 strips in all being used in the country, with others going into operation every month.

At Pomona, Calif., the city itself operates a drag strip along a paved portion of an enormous parking area at its permanent county-fair grounds. Police estimate that as much as 90 percent of illegal street racing has been eliminated in areas that have drag strips where car owners can test their

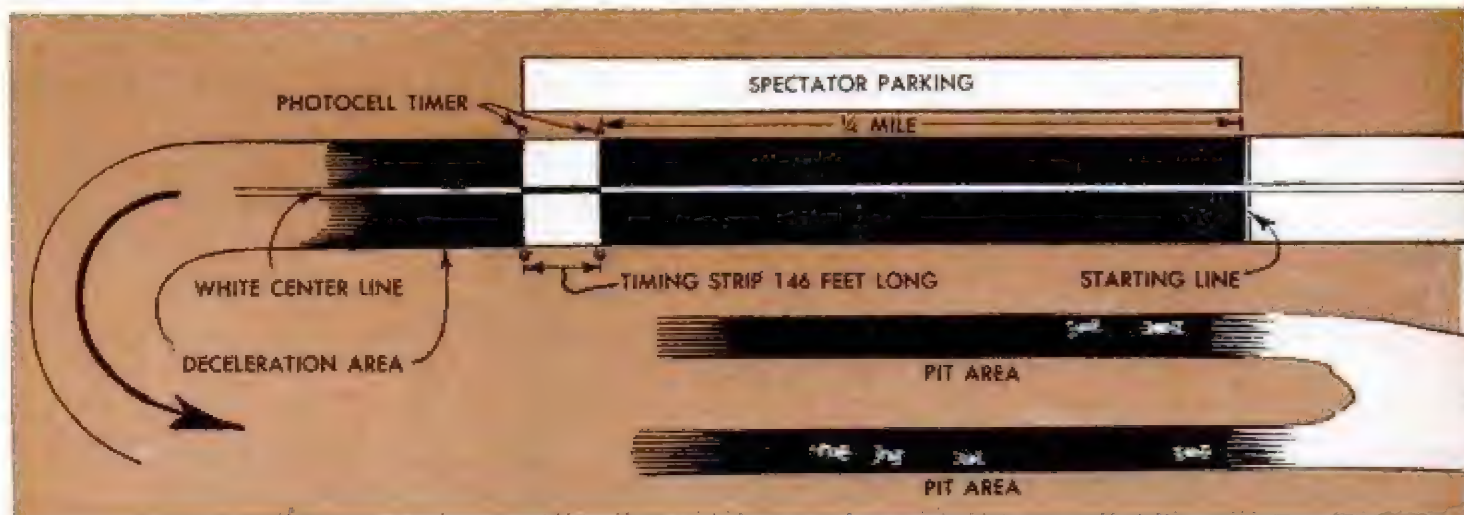
vehicles for rapid acceleration and speed.

In many communities, in fact, hot-rod clubs and police departments are getting together on a friendly basis. Members of a department give talks at club meetings and explain the reasons why traffic laws are enforced, for the safety of drivers themselves. Most clubs have a rule that any member who acquires three traffic tickets automatically loses his membership.

No drag strip is long enough for an ordinary car to attain its top speed, so the emphasis is on improved acceleration. The Santa Ana strip, more or less the model for all the others, has only a quarter of a mile for acceleration. There's an additional quarter of a mile at its end for decelerating and braking to a safe turn-off speed. Top speed at the end of the acceleration quarter mile is measured in miles per hour by an electronic timing device that has its electric-eye pickups spaced 146 feet apart.

Horsepower, light weight and traction are

Typical drag-strip layout. After a quarter-mile start, cars are clocked as they zoom through timing strip





On a normal Sunday at Santa Ana, 2000 spectators and 300 competing cars line both sides of the drag strip

what count in getting top acceleration. This has resulted in some weird-appearing vehicles. Some of these special creations have been clocked at 125 to 130 miles per hour in the time trap, about twice the speed that the fastest stock car can attain in such a short distance. Weight makes such a difference, all by itself, that the owner of one fast roadster finds that his wife, lighter than he, can drive at two or three miles per hour faster than his own best speed. Driving skill is mostly knowing when to shift into higher gear.

A typical "hot" acceleration vehicle consists of little more than chassis, engine and driver's seat. There's no body. The engine has no starter, no radiator, no fan. The vehicle is pushed by hand or by another car until its engine fires. The whole assembly weighs no more than 1000 pounds or so.

The engine is souped up to deliver more

than twice its original horsepower. Bore is increased, compression raised, high-lift cams installed and all passages smoothed down by hand. Special intake manifolds with two to four carburetors are installed.

To provide maximum traction at the rear wheels, the engine is moved as far back on the frame as is practical. The driver sits directly over the rear axle.

No ordinary tires can handle this combination of power and weight distribution. The tires would simply spin on the pavement, screeching and laying down long lines of black rubber. The best acceleration tires for the rear wheels are called "asphalt slicks." They consist of 7.00 x 16 carcasses recapped with a wide, smooth

Some dragsters use super-charged aircraft engines



CARS WAIT THEIR TURN





Roadster gets the go-ahead flag to start its run as two motorcycles wait their turn. For a small fee, a driver can go through the traps as often as he wishes

tread to present maximum surface to the pavement.

Some owners have tried dual rear wheels to get additional traction but there's no net gain in acceleration because of the added weight of the extra tires and wheels.

A fast-acceleration car can be built for as little as \$500. That's the amount that George Miller estimates that he has spent on his vehicle which has been clocked at 125 miles per hour at Santa Ana. Miller's car is powered with a reworked Mercury engine that delivers about 315 horsepower when fueled with a 50-50 mixture of alcohol and nitromethane.

Nitromethane has been called the poor man's supercharger because of the tremendous acceleration that this cleaning solvent provides when blended with alcohol or with gasoline and benzine. A blend of more than 25 percent nitro is so powerful that it's rarely used except for short acceleration runs, as at the drag strips. Engine heads, connecting rods and clutches are among the common casualties when experimenting with the powerful nitro fuels.

Some drivers, too, are adding small amounts of hydrogen peroxide to

their fuels because of the added oxygen that this chemical makes available in the combustion chambers. Up to five percent water often is stirred into some fuels to aid combustion-chamber cooling and prevent preignition.

When you see the pit crew of an acceleration vehicle rocking the car on its springs just before giving it a push-start you may be sure that the fuel tank holds an assortment of chemicals that don't readily mix. And you can bet that the engine will do one of two things: Make one of the fastest speeds of the day or literally fly to pieces before it reaches the timing trap.

All this doesn't mean that you need a true racing machine with wild fuels to win at a drag strip. Twenty-one classes of cars in all are timed at Santa Ana. Stock cars are divided into prewar and postwar classes. They are further divided into two classes with engines of 300 cubic inches or more plus all V8 overhead-valve engines in one and engines of less than 300 cubic inches in another. Stock cars must use an engine of the same year as the car body. It's against the rules to remove the fan or generator belts on stockers. But the engines themselves may be modified consid-

Not all runs are against time. Match races, as here, are often arranged among drivers
Hot Rod Magazine photo





Rear tires, called asphalt slicks, provide maximum traction. Contact area is almost seven inches wide

erably to provide an extra bit of power for better performance on the drag strip.

Among the other classes are "street" roadsters with full fenders and lights, "all out" roadsters modified in any way desired, full-fendered coupes and sedans, stripped coupes and sedans, and the true acceleration vehicles. Cups are awarded to the winner in each class on each race day. There are no hard and fast rules as classes vary from strip to strip, depending on local conditions.

The rules state that all "hot" vehicles must be equipped with roll bars (a safety bar that extends higher than the driver's head) and safety belt. All drivers must be at least 21 years old or furnish a notarized release from their parents. In addition, any car that appears to be in an unsafe condition isn't allowed to run.

The usual rule at a drag strip is to assign spectator parking to the right side of the strip, competition parking to the left side. Cars that get into trouble while racing almost invariably drift off to the left, hence this is a safety precaution for the specta-

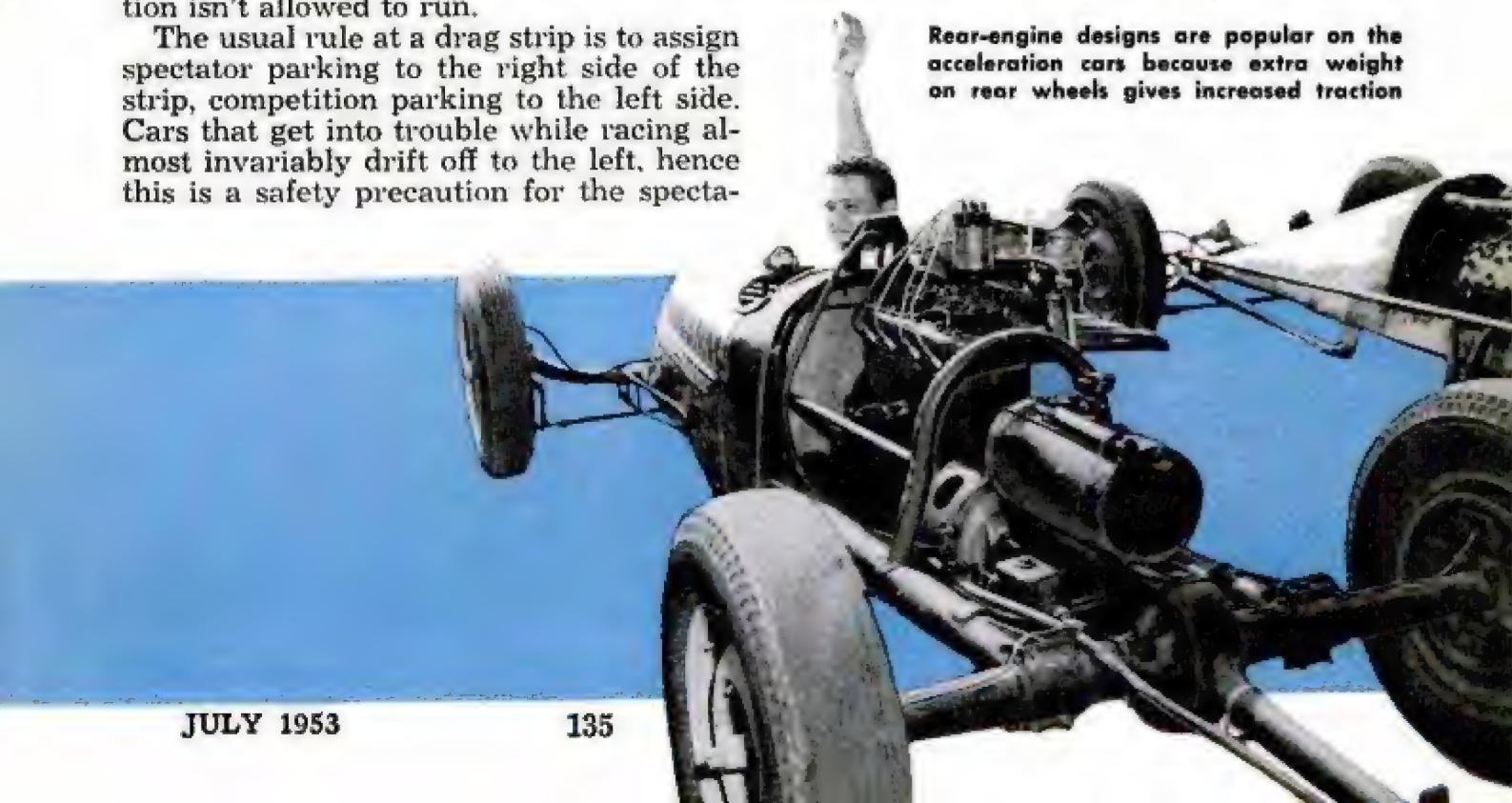


Three carburetors feed this V8. It has no radiator. If it boils, hoses deflect steam down to pavement

tors. But on a short drag strip there's little chance that a car will run wild. Most troubles consist merely of engine failures that bring a car to a halt. Other safety precautions include a stand-by ambulance, uniformed patrolmen who control traffic and maintain order, plus special public-liability insurance. The strip itself has a wide white line down its center as a guide for the competing cars.

Some of the drag strips are sponsored by clubs of drivers, some by advisory committees made up of interested citizens, some by private individuals who operate them for whatever profit they may bring. In all cases, the drag strips provide supervised courses on which drivers may test their cars for speed and acceleration under conditions of maximum safety. ★ ★ ★

Rear-engine designs are popular on the acceleration cars because extra weight on rear wheels gives increased traction





Clamping the motor, left, to the boat's side. Right, unfolding the foot-steering unit prior to installation

Noiseless Battery-Operated Motor for Fishermen

Noise, the bane of all fishermen, is eliminated by a battery-operated motor that silently propels a boat. The motor also provides a means of steering by hand or foot. When foot-operated, the two-speed device leaves both hands free for fishing. The foot pedal stops, reverses, turns the boat around

and shuts the power off. Once the boat is maneuvered into the fishing area with the regular motor, the battery-operated device is clamped into place. When used for trolling, it will operate continuously for five to six hours. Batteries are of the wet-cell type and can be recharged in an automobile.

Plastic Sprinkling System Installed Underground

Designed to last for many years, a non-corrosible plastic sprinkling system is buried beneath a lawn without damaging the turf. A knife, a screwdriver and a square-cut garden spade are the only tools needed for installation. The hose is usually cut in 10-foot lengths to accommodate the plastic spray heads, each able to cover 100 square feet of lawn area. Screw clamps from the kit join all connections. After the system is assembled and tested, it is ready for burying. The spade is inserted at an angle to a depth of six or eight inches and then shoved forward to make a crevice in the lawn. Tubing and heads are placed in the crevice and the sod tamped back together with the foot.

¶ The capacity of the American steel industry now stands at the highest level in history—117,547,470 tons.



"Wheelbarrow" Kettle Broils Complete Meals Outdoors

Mounted on a wheelbarrowlike carriage, a portable charcoal broiler can cook a complete meal. It has two grills; one supports the hot glowing coals, while the other, mounted above, holds the food to be cooked. Two dampers, one in the close-fitting lid and the other in the bottom of the kettle, control the rate of burning. After use, the fire can be extinguished by placing the top on the kettle and closing both dampers, thus saving the charcoal for further use. Since the unit is weatherproof, it can be left outdoors indefinitely. The kettle can be removed for use in standard fireplaces.

Paint-On Solder

You simply paint on a new paste solder, then heat with an iron or even a cigarette lighter to make a tight joint. The material contains its own flux. When heat is applied the paste becomes liquid, then darkens to indicate that process is complete. It will penetrate tight joints difficult to reach with ordinary solder.

Gun Mount With Trigger Steadies Movie Camera

Devised by a big-game hunter, a gun-stock mount for movie cameras assures steadiness under all shooting conditions. Dispensing with tripods, the mount provides contact with two hands, the cheek and shoulder. Operated like a gun, it is equipped with a pistol grip and a trigger for long or short "bursts" of picture taking.



Daylight Developing Tank Has Self-Loading Feature

Practically loading itself, a new daylight developing tank keeps film from buckling, binding or scratching. The photographer simply aligns the reel flanges and then inserts about two inches of the film under a spring-loaded ball ratchet. As he moves the flanges back and forth the ball ratchet grips each side of the film alternately and feeds it smoothly into the grooves. The reel's top flange is transparent to permit the second exposure necessary for color-film developing without removing it from the reel.

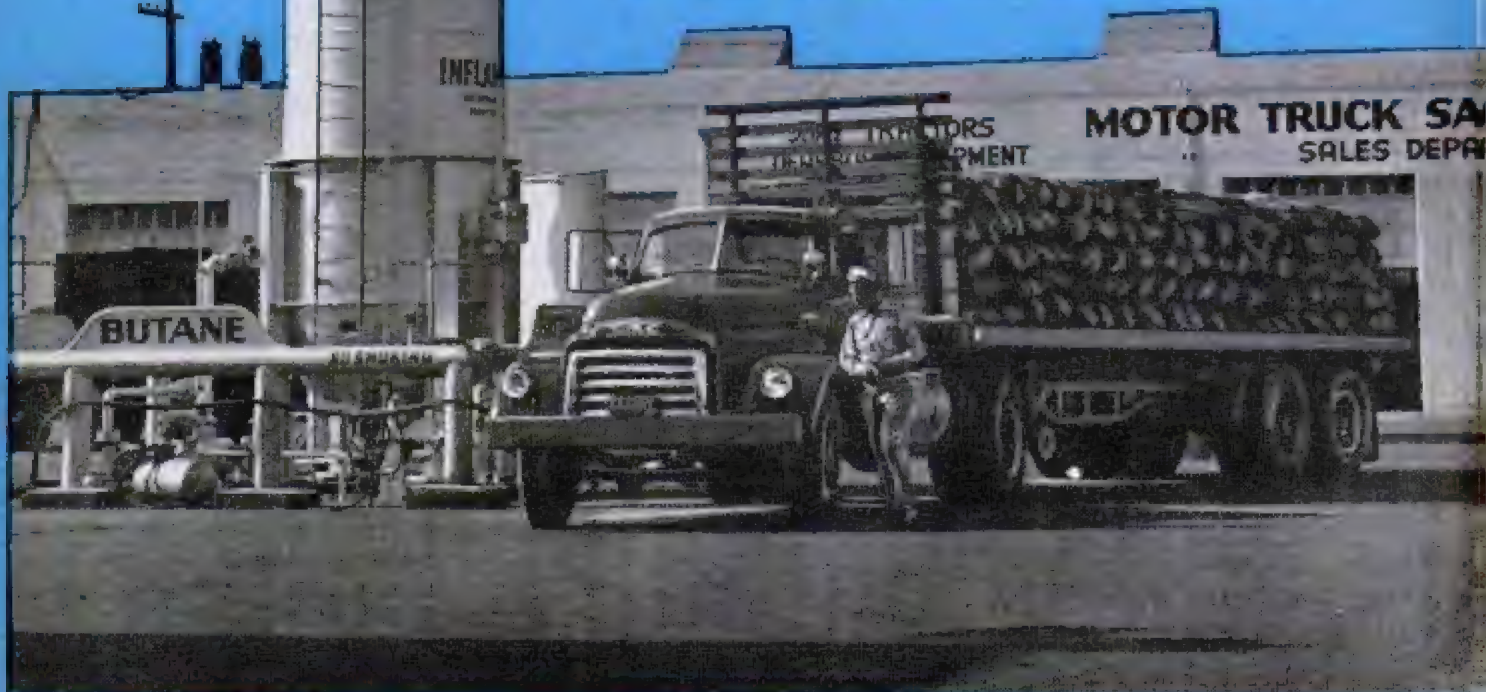


Fancy Service for the **BIG TRUCKS**

By
Jack B.
Kemmerer



Above, filling truck with butane from the 60-foot tank, left





Lubrication is done without delay on 70-foot-long pits which, like the fuel pumps, are open 24 hours a day

SERVICE STATIONS are as American as apple pie and ice cream. Motorists long ago ceased to exclaim at their facilities. Even the comedians have stopped making jokes about windshield washing and the other extras that are customary when you stop for gasoline. But there's a station at Bakersfield, Calif., that will startle even the most experienced motorist!

Located on Highway 99, said to be the most heavily traveled truck highway in the world, the station specializes in quick and complete servicing of trucks as they haul tons of freight between Los Angeles and San Francisco.

The Ridge Route out of Los Angeles with its long grades is wearing on heavy equipment. The 300 miles from Bakersfield

Three stories high, the 126-foot canopy towers above the gas pumps. Even a giant truck looks small under it





Lug nuts are quickly removed with pneumatic wrench

north to San Francisco is a smooth, high-speed stretch on which truckers highball to make schedules. The station is spotted at the strategic spot between these extremes.

It covers 10 acres, includes 100,000 square feet of buildings, keeps more than 100 employees busy and represents a total investment of about \$1,000,000. It is by actual count, the station with the million-dollar service!

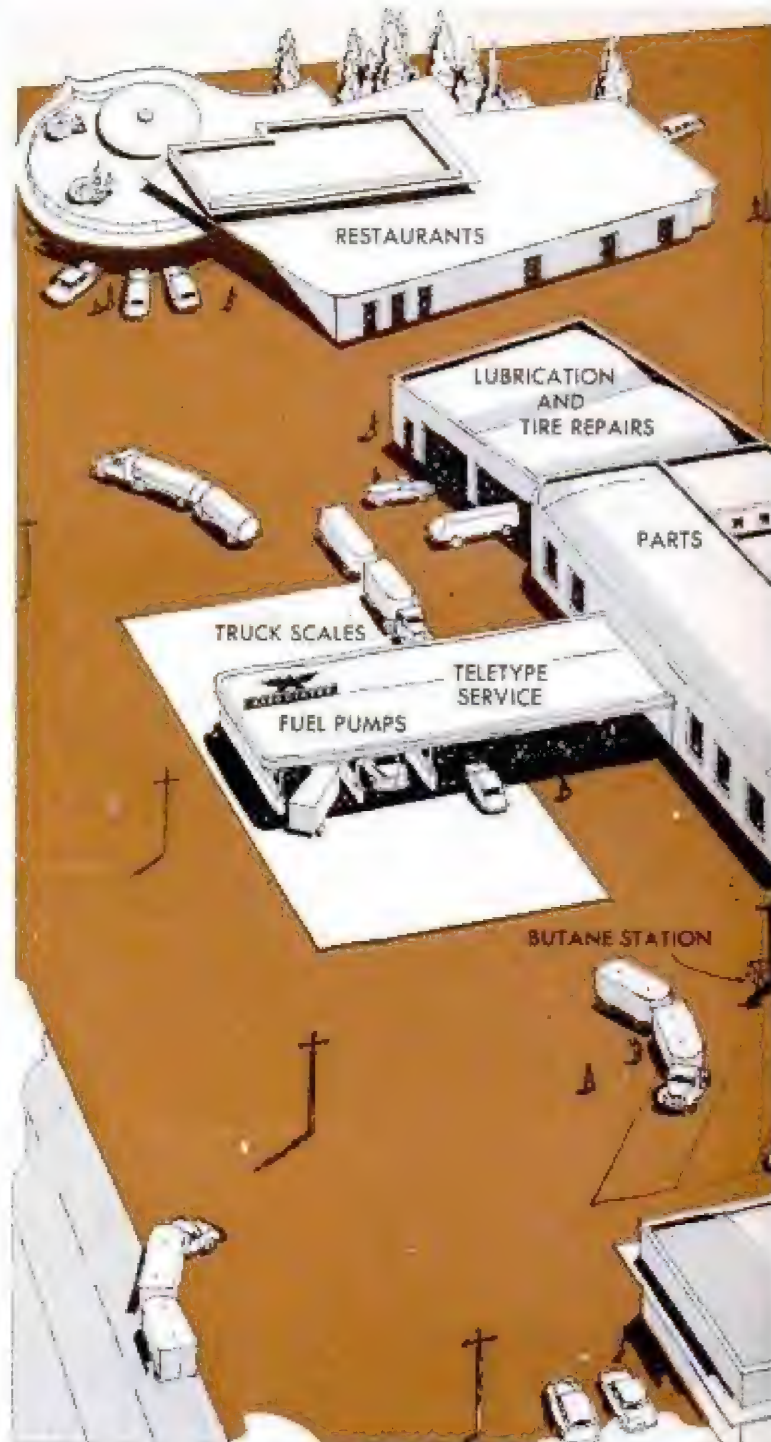
Under the huge canopy that extends out from the main building, four large truck-trailer units can be serviced simultaneously. Gasoline and diesel fuel are dispensed from 16 pumps. Because trucks usually have two fuel tanks, one on each side, the station's pumps are operated in pairs. Fuel is pumped into both tanks at the same time and the total gallons register on a single meter. All money is handled by a cashier who sits in a teller's cage by the pumps.

As the fuel is pouring into the tanks at a rate of 25 gallons a minute per pump, the attendants are making routine checks of oil levels, cleaning windshields inside and out, wiping all lights and reflectors, cleaning cab floors with a vacuum cleaner and thumping every tire for possible flats.

Also under the canopy are truck scales 70 feet long to weigh the longest unit on the highway. Weight certificates are made out for the drivers while they wait.

More and more trucks are burning butane these days, especially on Western runs. To fuel these vehicles, a 60-foot butane tank towers over the station providing not only storage, but also making a landmark that the drivers can spot several miles down the highway.

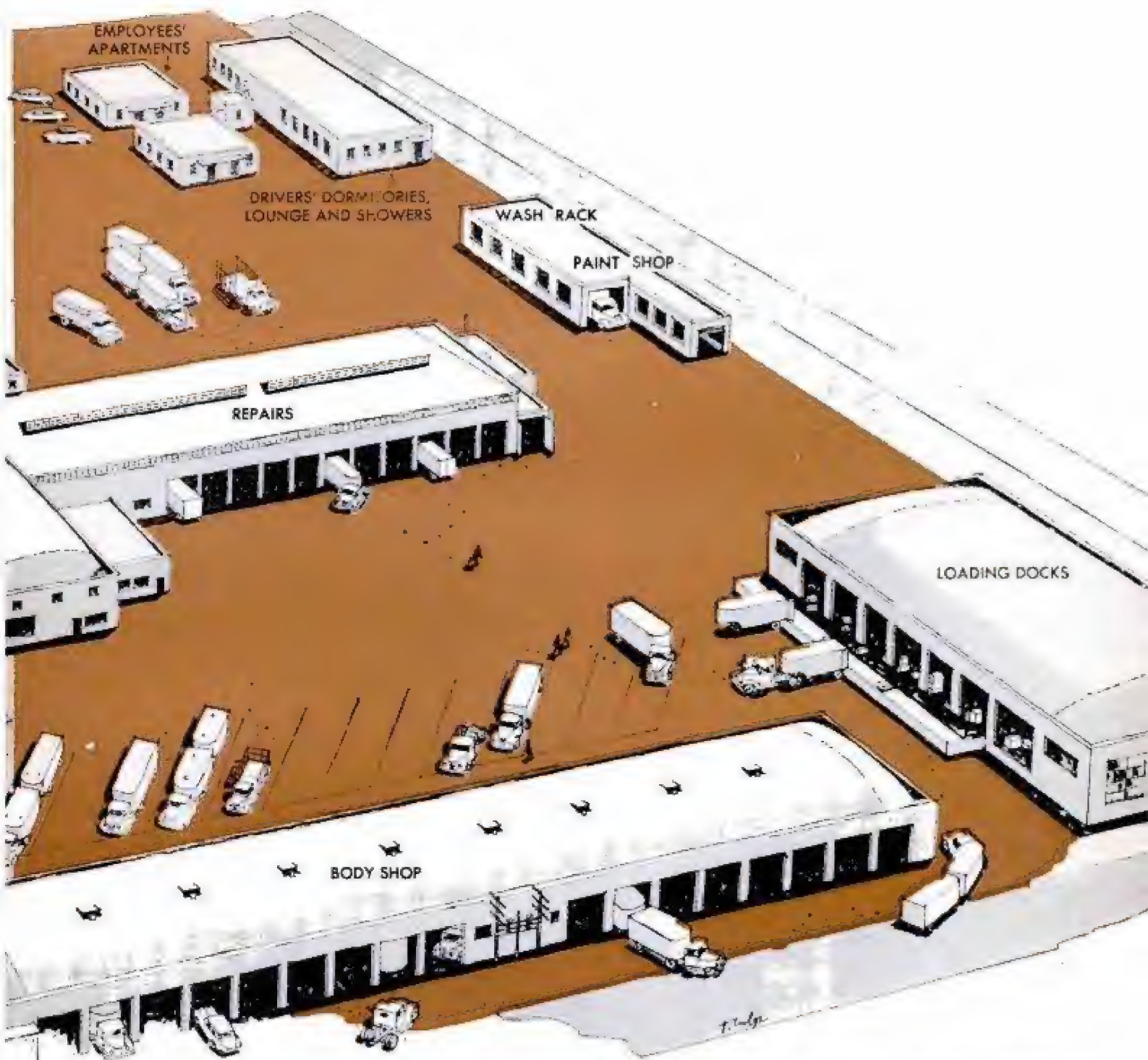
These are only the more obvious features



of a service station that has everything. Its lubrication department has two 70-foot pits that will handle the biggest of the road giants. Like the gasoline station, it is open 24 hours a day and can do a complete lube job on a truck-trailer in 30 minutes. Cold cathode lights around the pit rim give even illumination along the entire length of the vehicle.

Oil changes are made with fast-delivery hoses that dispense four grades of oil through metering nozzles. The oil flows at a gallon per minute and oil-change time is cut drastically.

The station's tire-repair department has specialists in the rugged job of handling heavy truck tires. Wheel lugs go on and off without effort, thanks to an air wrench. The latest in power equipment is used



Over-all view of the million-dollar station with its vast facilities. Below left, repair equipment includes a dustfree room for testing diesel fuel injectors. Right, a new truck gets its trailer brakes installed





Left, truck and trailer are lubricated in 30 minutes. Right, tire repairing is done by full-time specialists

throughout to speed the work, cutting delays to a minimum for the trucker.

Mechanical repairs are made in a service department that accommodates 13 trucks at a time. Each truck is worked on in a separate 80-foot stall that runs the full width of the building. When the repairs are completed, the truck is driven straight out—there is no backing or turning. In fact, that is a feature of the whole layout—all service areas are designed so trucks never have to be backed up nor does one truck ever interfere with servicing of another truck. Of course, there are facilities for the drivers' comfort. Restaurants, dormitories, showers and a lounge room make the weary driver look forward to his stop at the station. There is even a warehouse and loading dock where freight can be transferred,

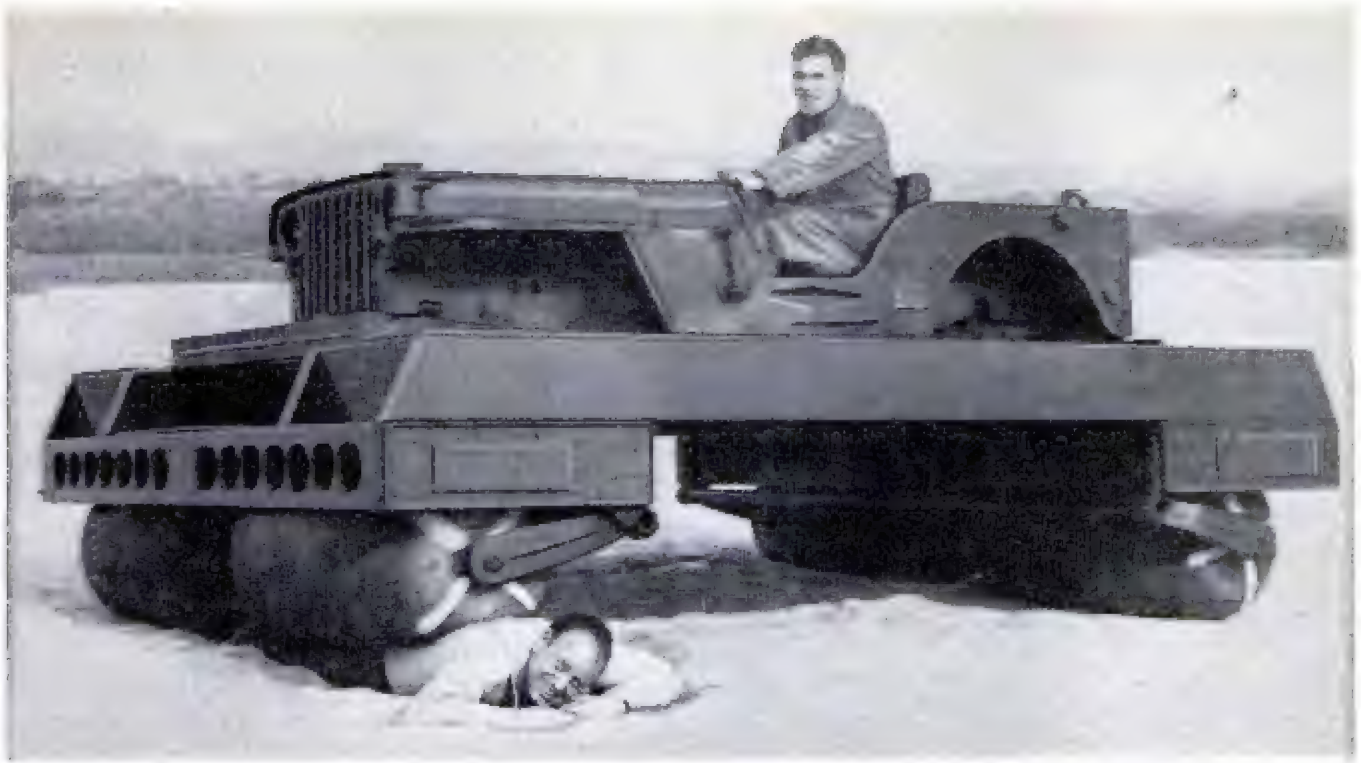
dropped off or even picked up en route.

As if all this weren't enough service for the truck companies and their drivers, the station also boasts a Teletype service. When a driver pulls into the station for fuel, he may be handed a telegram received from his boss a few minutes before telling him to stop at a certain point for a rush pickup. This service brings extra customers to the truck companies, too, because many businessmen wire pickup orders to the station and these are relayed to the first available truck passing through.

Everything considered, the Bakersfield station is the ultimate in service stations. It's no wonder the truck driver is happy to spot the tall butane tower in the distance. It marks a relaxing oasis after hours of jockeying a giant over the pavement. ★ ★ ★

Below left, four grades of engine oil are pumped to hoses at each pit. Right, a diesel gets a major overhaul





"Watermelon" Tires for Soft Ground Are Balloon Wheels

Shaped like huge watermelons, extremely low pressure "tires" enables vehicles to roll over sand and soft ground without bogging down. They absorb so much shock that springs are unnecessary. Designed for use on military vehicles, they are more than tires. Actually, they are wheels mounted directly on an axle. However, the axle does

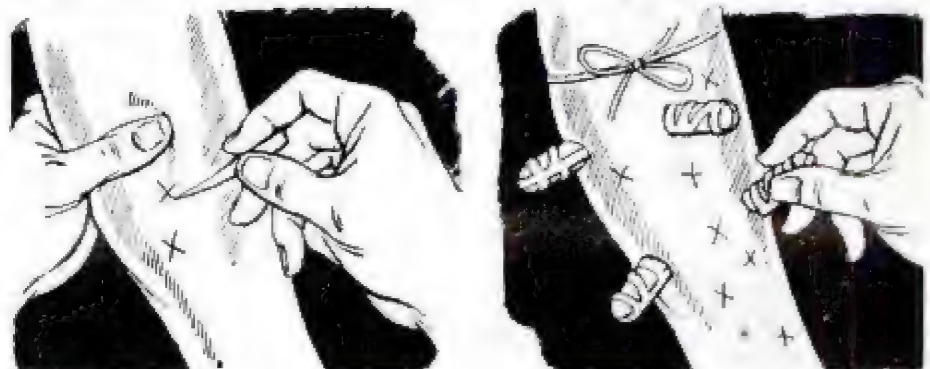
not drive the vehicle. Instead, a series of rollers on the underside of the frame rubs against the top of the balloon wheels and rolls them along. Air pressures of $1\frac{1}{2}$ to 5 pounds are used in the tires. So effectively is the load distributed by the supersoft tires that a Jeep equipped with them can roll over a prone person without hurting him.

Snake-Bite Kit Carried in Pocket

So compact it can be carried in your pocket, a complete snake-bite-treatment kit is no larger than a shotgun shell. Three suction cups for extracting venom from the wound are included in the kit. The two larger cups form a soft-rubber case enclosing a smaller suction cup for narrow areas, a knife blade for making incisions, antiseptic and a tourniquet tape.



Sources of available products described in this issue are indexed on pages 12, 14 and 16. Sources of further information on other articles are listed in the WHERE-TO-FIND-IT LIST, which is available from the Bureau of Information, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11





Cultivator is used for bench seedbeds or, with extension handle, for ground beds. Below, steel tines do the work



Attachment converts the tool into a chain saw which will fell trees 20 inches in diameter, trim dead wood



Miniature Cultivator Doubles as Other Tools

CULTIVATING flower beds is easy with a miniature electric tiller that also can be converted into other tools for home use. The cultivator, which weighs only 15 pounds, is driven by a $\frac{3}{4}$ -horsepower motor. It is powerful enough to dig deep into hard-packed soils or sod, yet is small enough to mulch the surface, cultivating between plants and along the edges of flower beds. It is also expected to be used in nurseries and greenhouses, as it speeds the preparation of bench seedbeds and small ground plots. The basic tool has bent steel plates which rotate to bite into the soil. Also provided is a 33-inch drive shaft so the operator can use the tool without stooping. With a 14-inch chain-saw attachment, the operator can fell trees up to 20 inches in diameter. A $\frac{1}{2}$ -inch chuck is available to convert the tool into an electric drill. Other attachments include a grinding wheel and arbor, a rotary trimmer for edging lawns and flower beds, and a pair of floor-sanding drums and polishing brushes. The basic tool is purchased as a cultivator, a chain saw or an electric drill, with the attachments available separately to convert the machine into the other tools.



With extension rod and sanding drums or brushes, versatile tool refinishes or waxes the floors

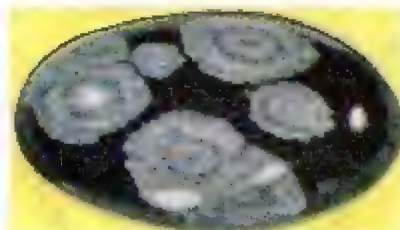
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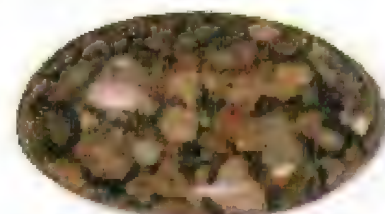


Orbicular Jasper

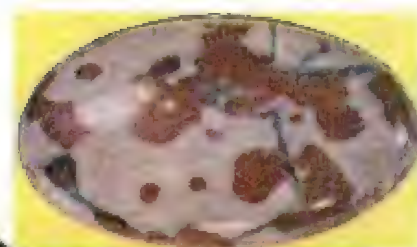


Flowering Obsidian

COUNTLESS CENTURIES ago man discovered that he could enhance the beauty of ordinary pebbles by crudely shaping and polishing them, and so developed an art called lapidary, which has continued through the years. Although there has always been a latent interest in lapidary, the art of gem cutting was steeped in mystery—the secrets of the craft being handed down from father to son—until a comparatively few years ago. During the '30s, however, an interest in lapidary crafts as a hobby began and proceeded to grow rapidly until now there are thousands of amateur gem cutters utilizing modern



Jasper Conglomerate



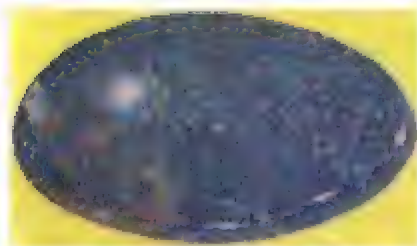
Orbicular Jasper

From Rocks to GEMS

By Ray Mitchell

Part I

XO-05



Sodalite



Riband Jasper





The excellent collection of semi-precious stones pictured above amounts to a rock-hunter's dream. From left to right in the top row are: Arizona petrified wood, black agate, Mexican agate, Breccia jasper and Mexican agate. Second row: Datolite, Breccia jasper, Badlands petrified wood, unakite, Mexican agate, South Dakota jasper and calcedonia. Third row: Arizona petrified wood (2 pcs.), Utah agate, amazonite, Mexican agate (2 pcs.), jasp-agate and seam chalcedony. Fourth row: Mexican opal, gem rhyolite, chrysocolla, rhodochrosite (3 pcs.), mottled jade (2 pcs.), jasper, azurite and petrified wood. Note 6-in. rule in photo

machines and techniques to bring almost undreamed of beauty from ordinary-looking rocks.

The rocks, as taken from the earth, are either in the form of pieces broken from a larger deposit by the rock hunter, or are found as weathered rocks or pebbles previously broken from the original deposit. They are rough, frequently large and usually show but little of the beauty of pattern and color that cutting and polishing can bring out. The lapidary cuts these rocks into slabs, grinds them to

Chunk of calcedonia is cut on diamond slabbing saw, below, and sawed surfaces are inspected for flawlessness, pattern and color. Best section is cut into 1/4-in. slabs



PM photos
by
Frank P. Fritz

shape, polishes them to mirror brightness and then mounts the finished gems to form attractive jewelry or classifies and assembles them into collections of rare beauty and interest. The unmounted gems pictured on these pages are cabochons taken from one extensive collection, while the photo at the top of the opposite page shows a widely varied display of rocks and slabs from which such semi-precious gems are cut, ground and polished.

To follow the lapidary process from rough stone to finished gem, a chunk of agate taken from Horse Canyon, Calif., weighing about 1½ lb., will provide a typical example. The agate is semiopaque so that the inside pattern cannot be seen by transmitted light, but a greenish tinge of transmitted light, plus green streaks on the surface indicate the presence of green moss in white agate. The agate is dipped in water and the surface inspected while wet to locate a plane through the stone at right angles to the moss pattern which is visible on the surface. It may be necessary to grind away a bit of this surface in order to properly locate the sawing direction.

Next, the stone is chunked in a diamond slabbing saw in such a way that one or two good slices will be obtained after removal of the outside heel. After the first cut is made and the pattern and quality of the stone appear to be satisfactory, several ¼-in. slabs are cut from the stone. The slabbing saw as well as the smaller trim saw, which also has a diamond-charged wheel, are not essential to the home lapi-

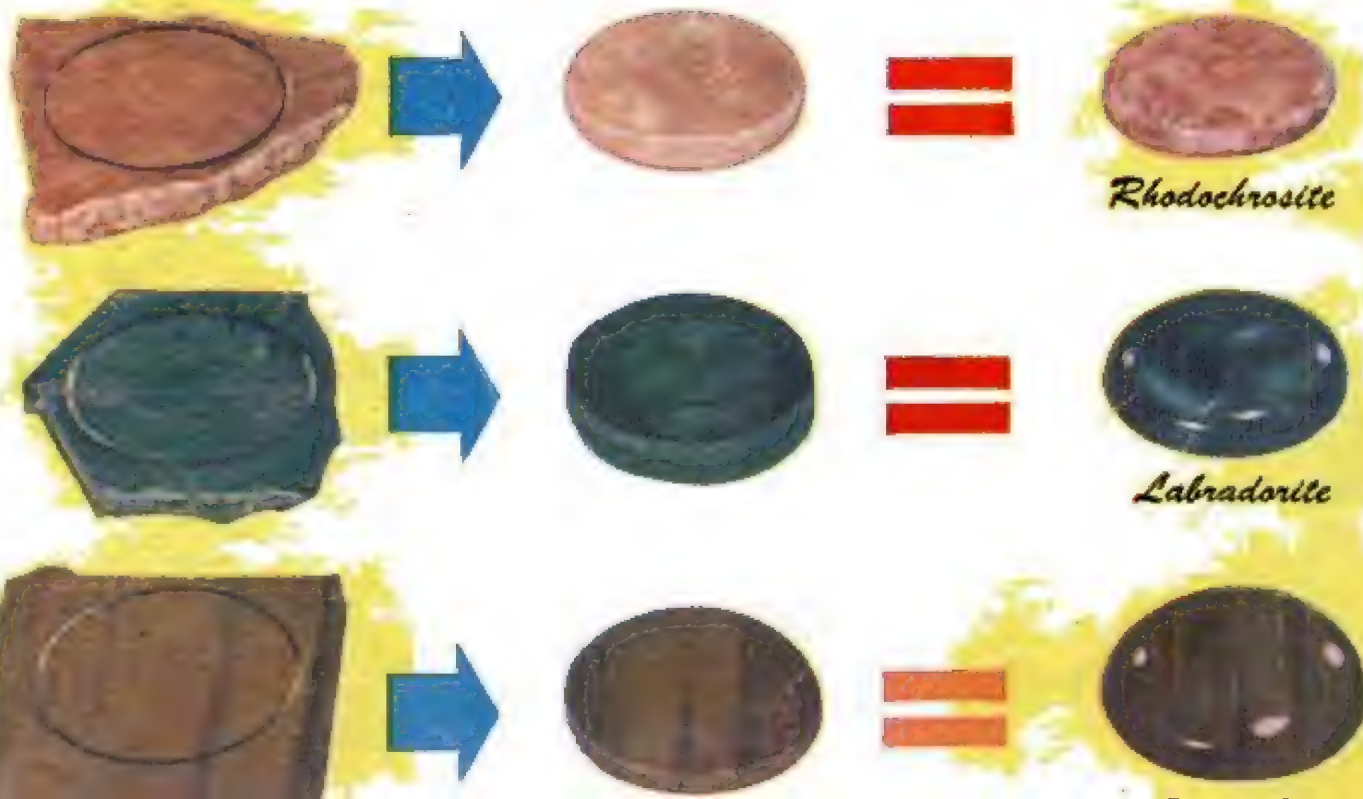


Skillfully selected and finished stones plus fine silver mountings add up to this beautiful jewelry

dary shop, as many communities have public-sponsored lapidary shops in which you can have the rocks cut, or there probably is a local lapidary with a well-equipped shop who will be glad to do this work for you. If there are no convenient facilities available for sawing the rock and you don't wish to equip your shop with more than a grinding and polishing bench, the stones are readily purchased in slab form.

After a suitable slab has been selected, clean the surface with soap and hot water and then mark out the shapes of the desired

Here are the basic steps in transforming a slab of stone into a brilliant gem. The marked slab, left, is sawed and ground to form a disk, center; then reground, sanded and polished to fashion the finished gem, right





Azure-Malachite

Wax-tipped dop stick allows stone to be held conveniently for grinding and polishing. Photo at right shows edges of the stone being ground



Montana Agate



In photo above, bracelet gems are Wyoming jade, ring is orbicular jasper and the pendant, labradorite

When dopping a stone, below, it is important to work wax around base of stone to center it over the stick



Rhodochrosite

gems, using patterns or templates and an aluminum pencil or sharpened aluminum rod. The aluminum is preferred to an ordinary lead pencil, as lines from the lead pencil will wear away while you are working the stone. Take special care to see that no flaws or cracks are included in the portions of the slab selected for the gems.

The marked blanks are carefully sawed apart and the shapes of the stones are roughed out, both operations being done on the trim saw and all the cuts being made on the outside of the gem outlines. These pieces, called cabochon blanks, now are ready for the shaping operation which is done on a wet lapidary grinding wheel. The blanks are shaped accurately to the marked outline, using a 100-grit wheel, the sides being kept straight and at right angles to the flat surfaces. After the blanks have been shaped, they are mounted with wax on the ends of $\frac{1}{4}$ -in. dowels which are called dop sticks.

To mount the blank on the dop stick, heat the stone slowly to the melting point of wax, using a low-heat oven or an electric heating element. Meanwhile, melt some wax to the consistency of heavy cream, heating it in a metal container. Then dip about $\frac{3}{4}$ in. of the stick into the melted

wax and press the waxed end of the dop stick against a cool metal or porcelain surface, holding it there until the wax retains a cone shape having a flat end. While the wax is still workable, press the end against the flat base of the stone and remove the stone from the heat. Shape the wax around the base of the stone, using your fingers moistened with a little water, and adjust the dop stick so that it is centered under the stone with the surfaces of the stone at right angles to the stick. This adjustment is important, as it is difficult to perform later operations accurately if the stone is crooked or off center. Ordinary banker's or express sealing wax is suitable for the dopping operation, although special jeweler's wax is a bit stronger and more adhesive. Prop the stick vertically for cooling, with the stone at the top, so the stone will not sag or creep before the wax has had time to harden.

The sides, or edges, of the dopped stones are ground on the 100-grit wheel to an angle of 8 to 10 deg. to the base. This slight bevel is carried to within $\frac{1}{32}$ in. of the base of the stone, being especially careful not to cut into the base. To be sure that you don't cut too far, mark around the edge of the base with an aluminum pencil. As long as the pencil mark remains intact, you are not bringing the cut down too far. The face, or top, of the stone is now shaped as desired to form either a rounded or flat top with straight sides or a full-round cabochon; that is, with the top rounded almost to the base

to eliminate the straight sides entirely.

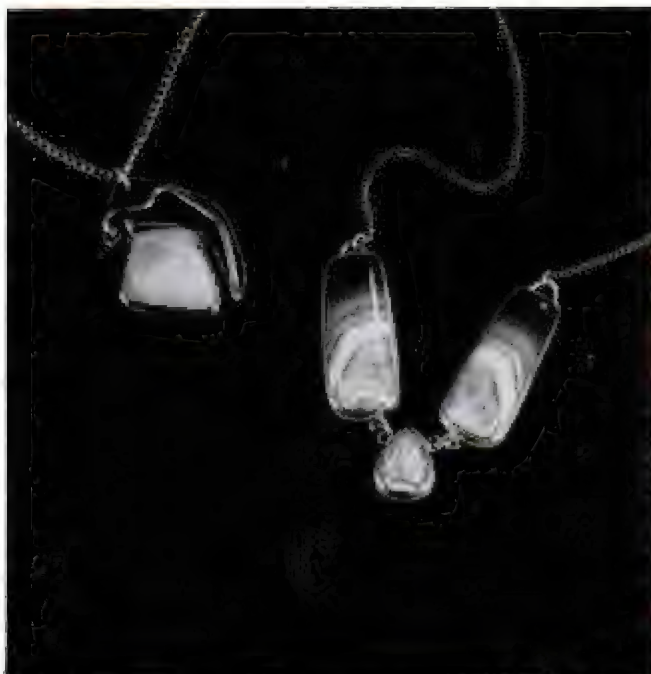
When the top has been evenly and smoothly shaped, move on to a 240-grit lapidary grinding wheel. With this wheel, grind lightly and evenly over all surfaces to remove coarse scratches and flats made by the 100-grit wheel. Be sure to keep the stone in motion at all times when it is in contact with the wheel, as a flat spot will be produced whenever the motion stops with the stone in contact with the abrasive. The stone is now shaped and the surface is quite smooth, so all following operations are aimed at producing a mirror surface on the gem by using progressively finer abrasives.

After using the 240-grit wheel, many gem cutters prefer to finish the stone on a horizontal lap. This is a machine consisting of a motor-driven cast-iron disk which rotates on a vertical spindle. A mixture of 200 or 240-grit silicon carbide and water is applied to the surface of the disk and the stone is ground by holding it against this abrasive. Although by no means necessary for a creditable job, the horizontal-lap process is excellent for cutting straight edges or flat surfaces and, as it cuts much more

Before polishing, shaped stones are sanded by hand or on belt or disk sander. Water is used to cool the stone when machine-sanding with 120 or 240-grit cloth

Stones in bracelet and ring, upper right, are black jade. Those used in the jewelry shown below are moss agate





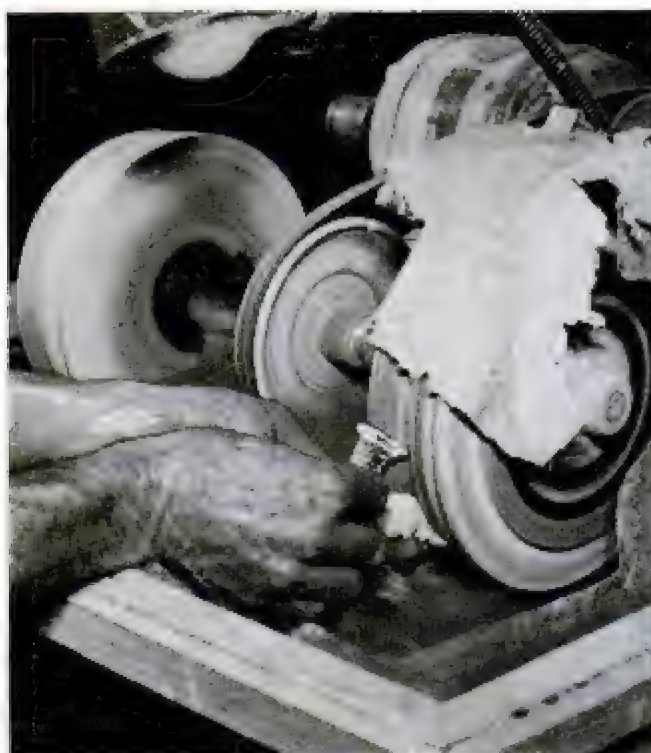
Sanding of the stones can be done by hand, using 200-grit silicon-carbide cloth placed over a hard surface, as above. No coolant is required. The mounted gems, pictured at left, are Montana agate



slowly than a bonded wheel, a smoother surface results.

After being cut on the 240-grit wheel or horizontal-lap machine, the stone is ready for sanding. This is done by hand or with a disk or belt sander. On either machine, first smooth the stone with 120-grit cloth and follow with 240-grit, using water as a coolant. The coarser grain is used in primary sanding to cut down the high spots rapidly, the cushioning effect of the cloth or paper resulting in much shallower cuts by the abrasive grains than the grit size would indicate.

For hand sanding, first use 200-grit silicon-carbide cloth or paper placed on a hard backing. Apply the stone to the cloth with firm but not heavy pressure and with long, even strokes. As little heat is generated by hand-sanding, this operation is best done dry. Here again, roll the rounded surfaces of the stone constantly while sand-



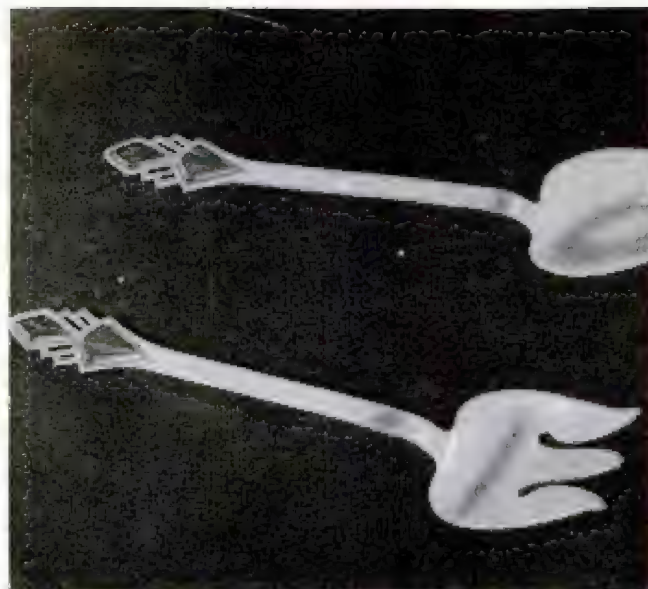
After grinding, stone may be finished on horizontal-lap machine, center photo, before sanding. Photo at left pictures primary polishing with wooden wheel charged with tripoli or levigated alumina



ing to avoid flats. Wipe dust from the stone frequently to permit inspection and, when all flats and ridges have been removed, place a thick layer of newspaper or a piece of soft rubber under the same sanding cloth or paper. Then continue sanding until the surface of the stone begins to show a slight polish and no flats or scratches are visible. For final sanding, use a 400 or 500-grit paper against the soft backing. Inspect the sanded stone under a single bright light, observing the light reflection in the surface of the stone as it is turned in all directions. Any flats will be immediately visible as the reflection passes over them.

Before beginning the polishing operation, wash the stone and your hands thoroughly, as any trace of previously used abrasives will contaminate the surfaces of the polishing wheels. For the primary polish, use a wooden wheel kept wet with a thin creamy mixture of tripoli or levigated alumina and water. For convenience in charging the wheel, keep two jars alongside the wheel, one with the powdered tripoli or alumina and the other with water and a rag for applying the mixture. Start the machine and apply water to the wheel with the rag until the wheel is thoroughly wet. Then dip the rag into the powder and apply to the periphery of the wheel. Keep the wheel well wetted with the polishing mixture while dressing all surfaces of the stone. Use medium pressure of the stone against the wheel at the beginning and reduce the pressure as polishing progresses. Dry the stone frequently for inspection. Although a clean rag is recommended for this, many lapidaries simply wipe the stones against their forearms.

When the stone has acquired a high even polish, with no dull spots, scratches or flats visible, wash the stone and your hands thoroughly and proceed to the final polishing operation. If any scratches or flats persist, the sanding operation is repeated and the stone is again given a primary polish-



Beautiful sterling-silver salad set is enhanced with attractive pieces of jasper mounted in each handle

ing. For the final polish, use a hard felt wheel with tin oxide and water as the polishing agent. Use the same charging and polishing techniques as with the wooden wheel but with a lighter pressure. Also, be extremely careful that the felt does not become dry, as felt generates heat very rapidly if not kept wet and will crack or "burn" the stone surface.

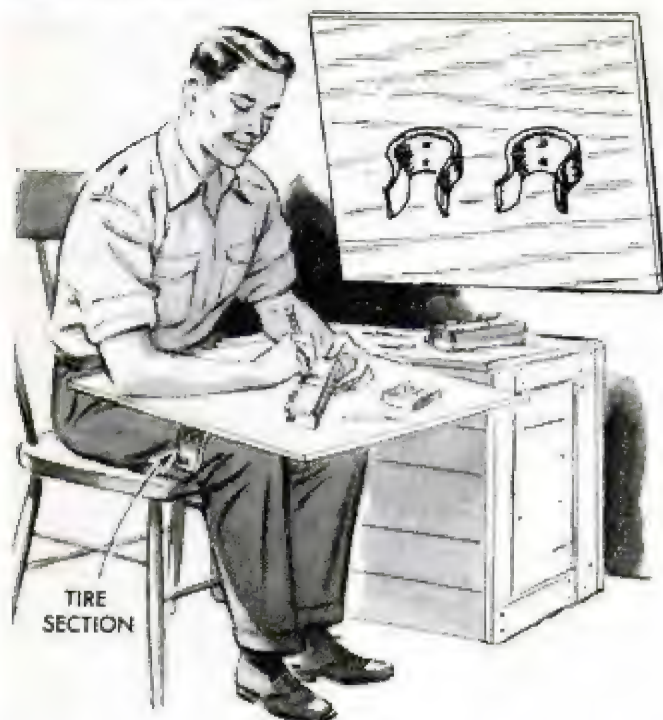
To remove the dop stick, hold the gem and the wax portion of the stick under cold water until the wax is chilled. Then lay the dop stick on a table and place a knife blade on the wax about $\frac{1}{16}$ in. below the stone. Give the blade a sharp tap with a piece of metal and the wax will split, releasing the stone. To remove excess wax from the stone, soak it in alcohol, acetone or turpentine.

Next month, Part II of this story will show you how to build lapidary grinding and polishing units, the basic equipment needed for home-shop gem cutting. ★ ★ ★

Three photos below show slabs marked to produce various gem shapes. Slabs are separated on trim saw

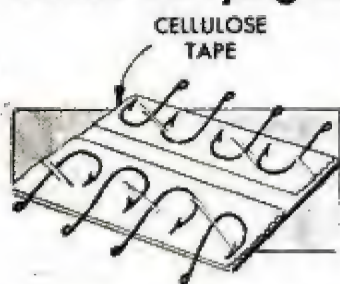


Lapboard Steadied by Leg Clamps Cut From Old Automobile Tire



Hobbyists, modelmakers and others who use a lapboard when cutting or carving various materials will appreciate this kink for steadying as well as securing the board to their legs. All that's necessary is to cut a pair of leg clamps from an old automobile tire and screw them to the bottom of the board as indicated.

Fishhooks Taped to Cardboard Permit Carrying Safely



To prevent possible injury from spare fishhooks carried loosely in his pocket, one angler tapes them to one side of a small piece of cardboard in the manner

shown. The use of transparent cellulose tape makes it a simple matter to observe and select a hook before removing it from the packet.

Jar Provides Protective Cover For Outdoor Electrical Outlet

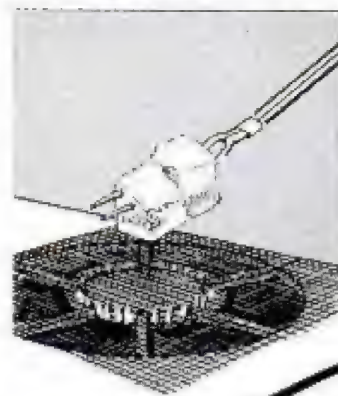
After running a cord through the casement of a basement window to accommodate a plug-in car heater, one car owner was faced with the problem not only of protecting the outlet from the weather but also from the hands of curious children. This was solved by passing the end of the cord through a hole punched in a jar cover, connecting the socket and then nailing the cover to the casement. Thus, whenever

the socket is not being used, it can be sealed and safeguarded easily by screwing the jar into its cover.

Walter H. Mason, Carlton Pl., Ont., Can.

Flame Deflector Over Stove Burner Prevents Scorched Marshmallows

You can easily toast marshmallows over a gas flame from a stove or hot plate if a piece of screen wire is placed over the burner. The wire will serve to deflect the flame and distribute the heat uniformly so that the marshmallows can be held fairly close to the heat source without scorching.



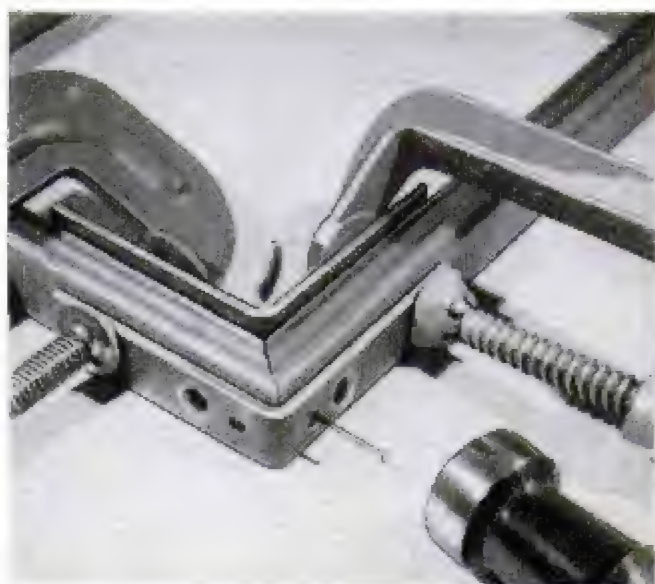
G. E. Hendrickson, Argyle, Wis.

Tightening Loose Wood Screws

To tighten a wood screw that has loosened in its hole, plug the hole with a glue-coated dowel. Let the glue dry, trim the dowel flush with the surface and then drive the screw into it.—A. E. Fenn, Chicago.

Picture Molding Held in Jig Of Steel Angle Brackets

It's a simple matter to glue and nail together picture-frame molding if held in a jig improvised from two steel angle brackets and a pair of C-clamps. The brackets, which are secured to both sides of the molding by the C-clamps, serve to hold the molding at a true 90-deg. angle. The outer bracket is drilled to provide $\frac{1}{8}$ -in. holes near the corner for driving nails into the molding with a hammer and nail set.

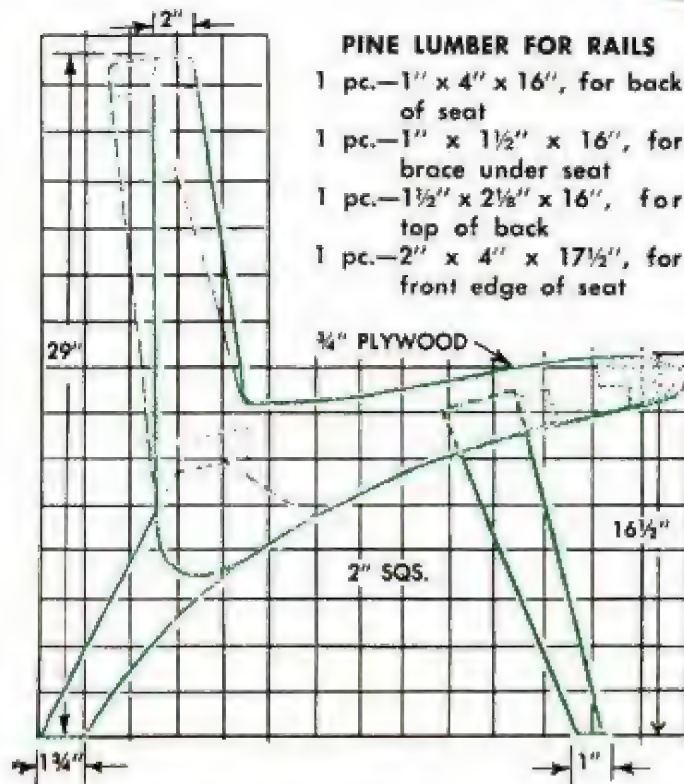


MODERN CHAIR

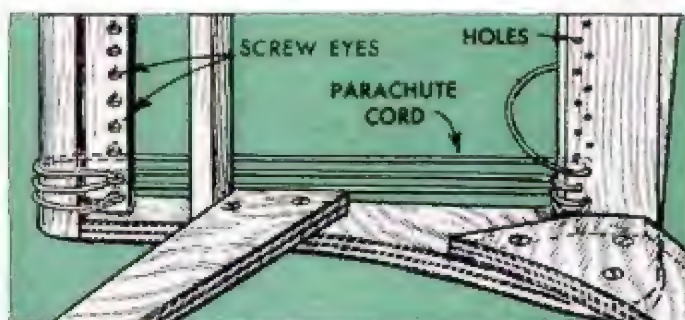
Of Cord and Plywood

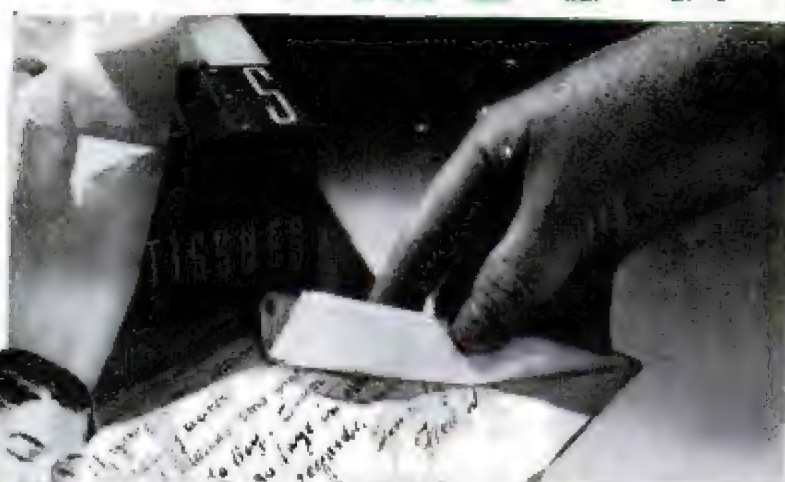
By Phil Palmer

ADD A DISTINCTLY modern touch to your room with this chair of plywood and parachute cord. In addition to plywood for the sides and legs, you will need the four pieces of pine shown in the material list below. The rail across the top of the back is beveled to a width of 2 in. to match the taper of the side-pieces. The front rail of the seat can be shaped either from a 2 x 4 or from a 1 x 4 and a 1 x 2 glued together. All joints are nailed and glued, using a plastic-resin glue. The chair is painted before the parachute cord is put on, applying wood filler, then an enamel undercoating and two coats of satin-finish black enamel.



Solid lines in pattern above show angle of back on original chair. Dotted lines show alternate angle





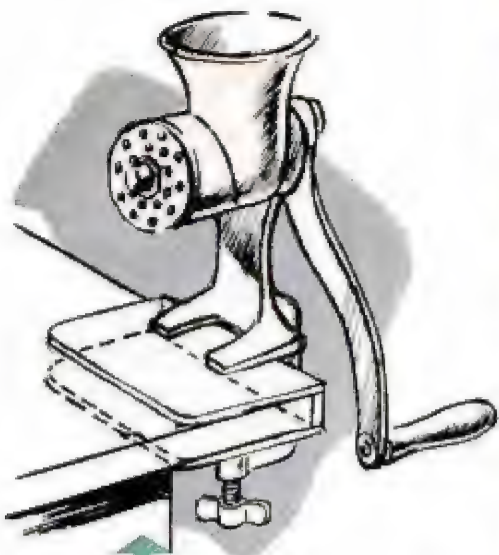
WHEN YOU NEED A BLOTTER, reach for your box of cleansing tissues. The loosely packed fibers of the tissues absorb the ink faster than a blotter



SMALL PAINT JOBS around the house will be less messy if paint can, brush, stirring stick, solvents and rags all are put into the cover of a large cardboard box. Gathering together all the supplies for the job helps to organize the work and if anything is spilled, only the box cover, which is easily thrown away, is spoiled



ELECTRIC BABY-BOTTLE WARMERS may have their efficiency impaired, after they have been in use for some time, by a crust of lime and other foreign matter left by the evaporating water. This acts as an insulation on the heating element. It can be removed by swirling a little vinegar around in the warmer. Allow vinegar to remain several minutes, rinse out and warmer is ready for use



FOOD-CHOPPER CLAMPS won't mark your kitchen table if you use the protector shown. Made of two pieces of $\frac{1}{4}$ -in. plywood nailed to a back strip, the U-shaped protector is flexible enough to clamp over the edge of the table firmly without leaving any unsightly dents or marks



KEEPING ICE CREAM FROM MELTING when carrying the package home from the store is a problem you can solve with this insulated box. A cardboard box big enough to hold the package of ice cream is inserted in a larger box, and the space between them is filled with an insulating material such as rock wool or finely shredded newspapers



THE CHAIN OF A DRAIN PLUG can be hidden by inserting it in the drain hole of the lavatory soap dish. When not in use the plug is placed in the soap dish with the chain lowered into the drain. To prevent its pulling out of the hole, a cotter key or wire is attached to the end of the chain

IF YOU HAVE A TODDLER who refuses to be fenced in his own room and disturbs the toys and quiet play of an older child, try putting a gate across the doorway of the older child's room. This will give the little one free run of the house, and the older child will have adequate privacy

SHORT-STEMMED FLOWERS may be floated in a bowl of water by inserting them in a paraffin disk. The disk is cast by melting paraffin in a double boiler and pouring it into a saucer. Flower holes are made by piercing the paraffin with a slightly heated ice pick



Cleaning Rod Simplifies Lighting Pot-Type Oil Burner



Lighting a pot-type oil burner, one homeowner found, could be done easily and more dependably with a torch made by inserting a small wad of paper through the eye of a rifle cleaning rod. This makes it a simple matter to lower the lighted paper into the burner where it contacts and ignites oil fed into the bottom.

Fuller Ball on Drill Chuck Prevents Marred Work



When using an electric drill on a finished surface, a Fuller ball slipped over the drill bit and pushed up against the chuck will prevent marring of the surface when the drill breaks through the work. An ordinary plumber's Fuller ball allows the drill to project far enough for most ordinary work, but if more projection is needed, the Fuller ball can be cut down.

Embroidery Hoops Frame Children's Pictures

Children will take great delight in framing drawings or pictures of animals and clowns in embroidery hoops for hanging on the walls of their bedroom or playroom. All that's necessary is to center the image over the smaller of the two hoops, press the larger one over it and then trim off the excess paper around the rim on the back. To provide a means for hanging the frame, a wire hook is used, or wire is given several turns around the expansion spring

of the outer hoop to form a loop. For added color, the frame may be painted. Framing their own drawings will especially please the younger children.

Scoop Made From Soup Ladle Removes Soot in Heater

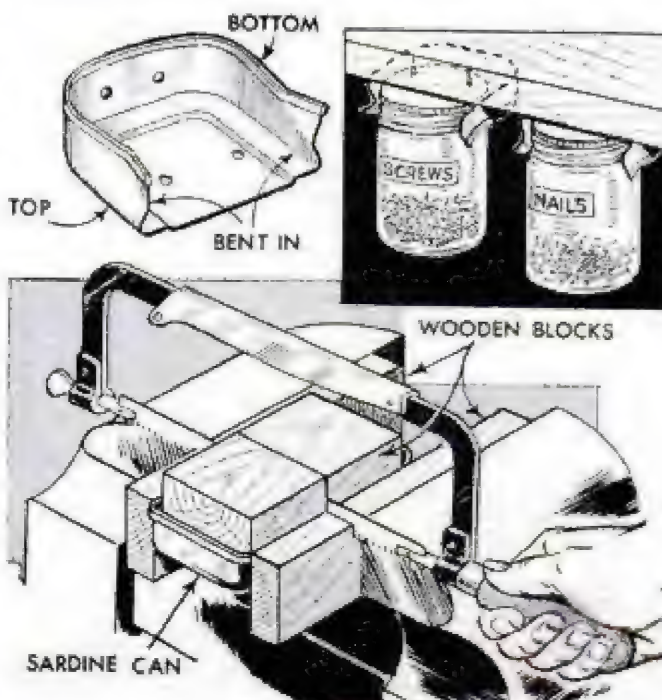
Cut and shaped in the manner shown, a long-handled soup ladle will provide an excellent scoop for scraping the sides and bottom of the fire pot of an oil-burning space heater and removing accumulations of soot. The long handle makes it possible to reach down into the pot with less likelihood of soiling the clothing.



Ken Murray, Colon, Mich.

Sardine Can Cut to Form Rack For Small-Parts Storage Jars

Sardine cans cut in halves and screwed to the underside of a shelf or bench top will serve as racks to hold jars in which screws, nails and other small parts are stored. The can is opened with a rotary opener, and is cut in halves by placing a block of wood in the can and one on either side of it, and clamping in a vise. Using a fine-toothed hacksaw, cut through both the metal and the wood. Then press the sides of the can inward so the bead will engage the jar lid. Lettering on adhesive tape applied to the jar sides can be used to identify the contents of each jar.—Carl S. Bates, Chicago.



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Fun on a PLASTIC Surfboard

By Bill Reid

HITCHING A RIDE on a beach-bound ocean wave with a featherlight surfboard is rated tops in water sports by practiced surfboarders. To handle well in the rolling waves the board must be stable, buoyant and light. Only a light board that rides high will take the full surge of an ocean roller and remain steady while you're in the long slide down the frontal slope just ahead of the crest. That's why the new foam plastic found a ready acceptance among surfers who make their own boards. The material is easily shaped and takes glue like wood.

To make a board of this material, you'll need about 80 bd. ft. of foam plastic in 9-ft. lengths and also a length of $\frac{1}{4}$ -in. plywood, 9 $\frac{1}{2}$ ft. long and about 4 $\frac{1}{4}$ in. wide. The latter is glued in at the center of the board to form a stiffener, or "keelson." The thickness of the board is 4 in. at a point just back of midships. The foam-plastic "boards" are glued up just like wood, using a waterproof glue and clamping with bar clamps. Before drawing up

Foam-plastic "boards" are glued together just like wood to form the body of the surfboard. A center stiffener, or "keelson," of $\frac{1}{4}$ -in. plywood gives extra strength and rigidity. Board is sawed to shape when glue is dry





Cut curved edges of board with a keyhole saw. At this stage handle board carefully to avoid chipping edges. Square forward end before gluing headpiece

the clamps, place softwood strips under the jaws of each clamp to prevent the narrow jaws from crushing the plastic at the edges. Note in Fig. 1 how the boards are clamped. After the glue is dry—and be sure it is thoroughly dry—square the forward ends and glue on short lengths of plastic to bring the length to $9\frac{1}{2}$ ft. Then cut the board to the rough shape shown in Fig. 2. Finish to contour as in Fig. 3, using a vegetable grater rather than sandpaper. The former does the trick faster and more smoothly as foam plastic does not abrade well. Note the sectional contour as in the detail on page 159. The topside, or deck, is rounded at the edges but the bottom is left flat for stability. When rounding, be sure that the contours are uniform on both sides. A simple cardboard template will help in checking for uniformity of the curves.

Next, apply a foam-plastic sealer to one side of the board and, while still wet, dampen the muslin and smooth it over the



Vegetable grater is used to round edges of board to contour. Grater does the trick faster as foam plastic does not abrade easily. Note in detail that bottom is nearly flat



After applying sealer, spread muslin and impregnate with sealer. Apply to one side only and allow to dry before applying sealer and fabric to opposite side

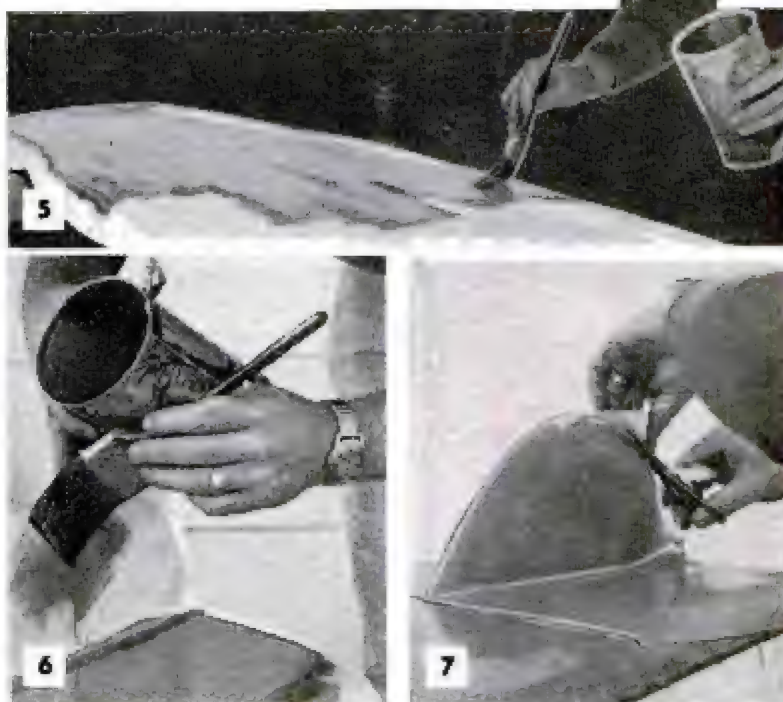
sealer as in Fig. 4. Be sure that the fabric is in full contact over the surface then apply a second coat of sealer, brushing it well into the cloth. Allow one side to dry before applying sealer and fabric to the other side. When dry (allow at least 8 hr.) turn the board over and apply sealer and cloth in the same manner. The fabric should overlap at the edges about $1\frac{1}{2}$ in. Give the laps an extra coating of sealer. After both sides are thoroughly dry, sand the surface lightly.

The final covering of glass cloth gives the board strength and rigidity. You'll need about $3\frac{1}{2}$ yd. of glass cloth and 1 gal. of laminating resin. You also will need a catalyst and hardener especially made for use with this product. Before using, be sure to follow the instructions for mixing the materials. Now cut glass cloth to size and lay over one side of the board, preferably on the side opposite that on which the first piece of muslin was placed. Coat immediately with the resin "dope," being

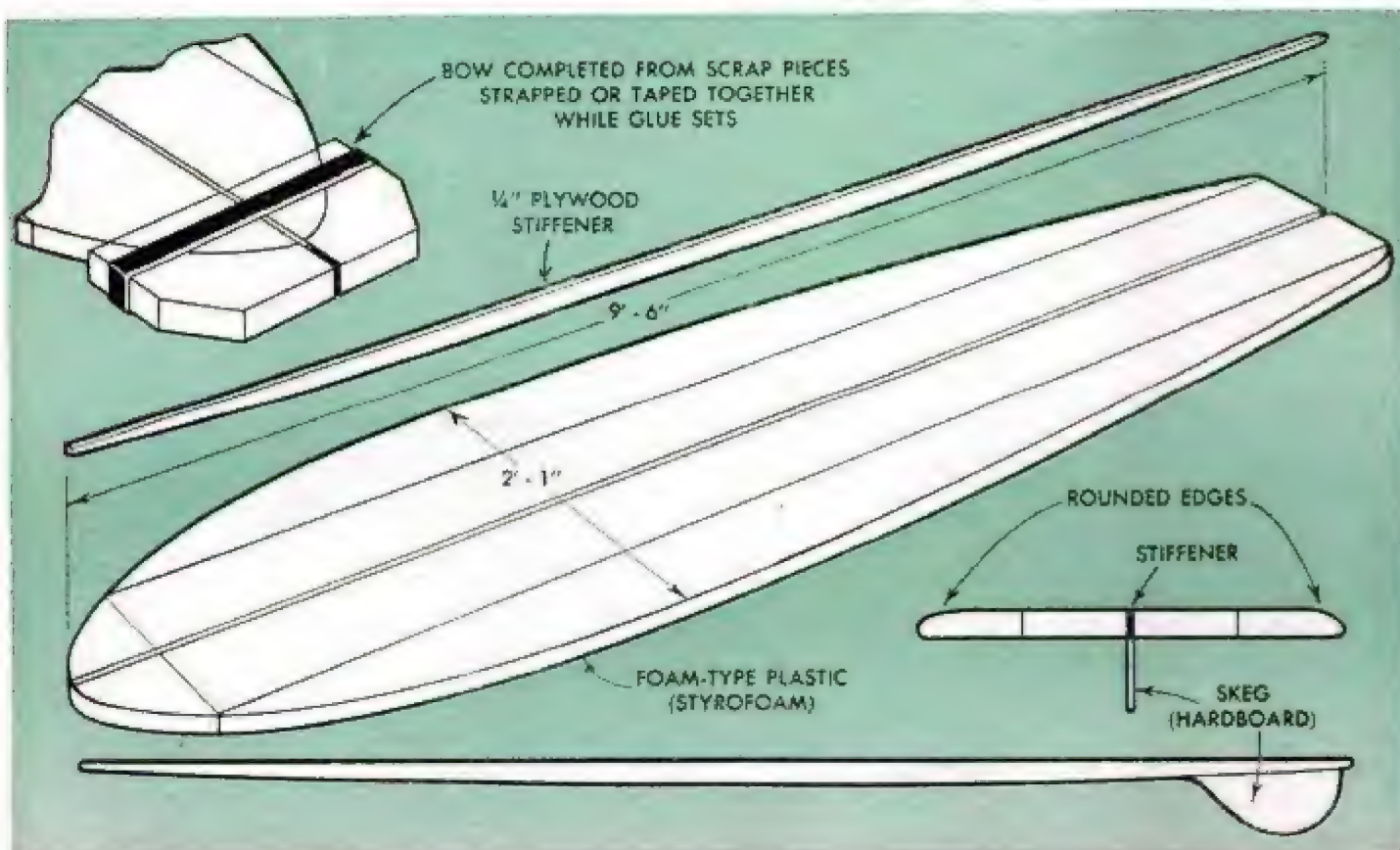
careful to spread the liquid in a uniform film, Fig. 5. Smooth out any bubbles or wrinkles that may appear. When one side is finished, allow to dry before covering the opposite side. When cutting the piece for the opposite side, be sure that you cut it wide enough to allow a 1½-in. overlap at both edges. Apply in the same manner as the first.

Figs. 6 and 7 show how to attach the skeg, which is cut from ½ or ¾-in. oak to approximately the shape shown in the detail below. It is about 8 in. wide and 12 in. long. Round the curved edge, then center the skeg on the stiffener. Some trimming may be necessary to assure a true fit. Brush the edge of the skeg, and also the area where it is to be placed, with the resin coating. Locate the skeg and then build up a rounded fillet on each side with strips of glass cloth laid in resin dope. Follow by covering the skeg with one thickness of glass cloth, trimming and overlapping the edges as in Fig. 7. As the final step in the construction, make a kneeling pad just aft of midships by laying two or more thicknesses of glass cloth in resin. Apply a final coat of resin to the entire board. Allow coating to dry thoroughly before using board. ★ ★ ★

After sealing, board is finished with a "skin" composed of glass cloth impregnated with a laminating resin. After mixing in accordance with instructions, this "dope" is applied over the glass cloth with a brush. Remove all wrinkles and blisters



Hardwood skeg is attached with a glass-cloth fillet built up on each side. Fillets consist of several strips laid in resin in each corner where the skeg joins the board. Finally, the wood is covered with a single thickness as in the right-hand photo



Novel Outdoor "Lanterns" From Milk Cartons



Children attending a lawn party will be fascinated by these novel "lanterns" that whirl and swing in a breeze when suspended by strings from tree branches. To make one, simply cut all four corners of a cardboard milk carton lengthwise from top to bottom, after which the sides are bent outward at the center to form openings at the corners. Then punch holes in the top and bottom of the carton so that a length of string, weighted on the end with two or three large washers, can be passed through the carton. The carton rests as well as rotates on the washers, which also serve to keep the carton from being buffeted about by the breeze.

Baking Pan Provides Tray For Small Parts



A metal baking pan approximately 3 x 12 x 15 in. can be converted easily into a handy tray for carrying small parts while doing jobs around the house. As shown in the drawing, a handle is fashioned out of 1-in. stock to fit the pan and is held in place by nails or small screws driven through the bottom and sides of the pan.

Albert Zanelli, Tampa, Fla.

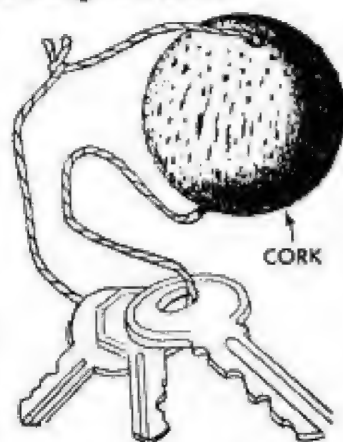
Paper Used as Mirror Frame

Mirrors with broken or badly damaged frames can be renovated if the old frame is removed and the mirror edged with a decorative paper, such as shelf or wall paper. A 1-in. strip of the paper is glued

directly to the glass all around the edges. The paper selected can match or harmonize with the color of the room in which the mirror is to be hung.—Mrs. Jeanne Villamil, Mechanicsville, N. Y.

Keys Carried Safely in Rowboat When Tied to Fishing Bobber

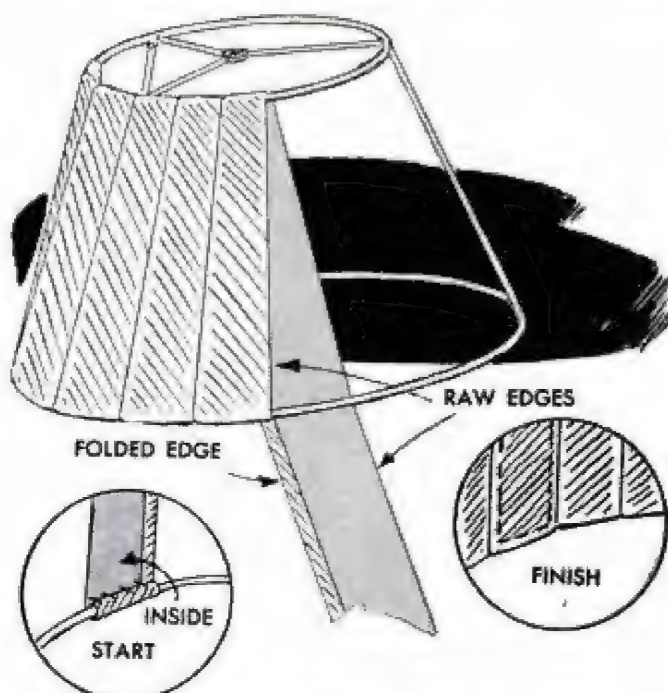
To make his keys more easily noticeable in the tackle box when out fishing in a boat, one sportsman strings them on a piece of fish-line that is run through a cork bobber and tied as shown. Another advantage is that if the keys, which ordinarily include his car keys and one for the lock on the boat chain, should be dropped overboard they will not sink.



Re-Covering Old Lamp Shade

Re-covering a lamp-shade frame when the old cover has become torn or soiled can save you money. To do the job, cut a continuous 3-in. bias strip from any kind of material. Fold the left edge of the strip under about 1/4 in. and then, with a tacking stitch, attach it to the bottom wire of the frame, as shown. Now wrap the material around the frame, making sure that the folded edge always overlaps the raw edge so that there are no gaps. At the finish, fold both edges of the material under and tack securely to the bottom of the frame.

E. V. Marchbank, Canton, Ohio.



CAMPING in COMFORT

By Lena Anken Sexton

CAMPING can be downright comfortable when you do a little planning beforehand. Much of the enjoyment of camping depends on taking along everything that is necessary—but *only* what is necessary—and in knowing how to conserve time and energy as you travel. For example, a compact aluminum cooking kit purchased at an Army-surplus store will solve the kettle, coffee pot, dish and cup problem for four, and take much less space than an assortment of pans and dishes from your kitchen. And consider the flexibility of cardboard boxes for packing. A box can be had to suit the needs of each trip and disposed of or replaced along the way, while hampers and suitcases remain the same size throughout the trip and must be brought home. Items that are frequently forgotten, and shouldn't be, are: Matches, compass, pocketknife, pencil, a shovel to kill the fire, extra flashlight batteries, a clothesline and clothespins and a wash basin. And take an ax instead of a hatchet, because most of the wood that can be cut with a hatchet is already burned. You will find a hundred uses for small plastic bags and, if heading into the mountains, you'll find a pressure cooker well worth the space it requires. Two other useful items for the trip are a water pail and a roll of aluminum foil. The foil is handy for campfire cooking, and the water pail, in addition to its obvious use, can serve as an oven when set in the campfire, as a double boiler with a small kettle in it, and when filled with hot coals, can be used as a stove to warm the tent. Don't try to carry all your food with you, but figure on making one grocery stop a day. Plan the menu several days in advance and buy accordingly. Don't underestimate the need for warm clothing just because it's summer, as high country, especially, can get uncomfortably chilly in the evenings. Take a light plastic raincoat for the member of the party who has to make forays in the rain. Public camping grounds are noted for camp stoves without fuel, so carry a small stove and fuel with you. Don't overlook a complete first-aid kit, which should contain, along with a variety of bandages and an antiseptic, a good insect repellent, sunburn creams and a sun-tan oil. And as a final caution, don't wander too far from camp, because in country that is strange to you it's very easy to get lost.



Teaching children neatness helps them enjoy camp life



Garbage is dumped into hole and covered with dirt



Poles pressed in ground raise cook stove to convenient height

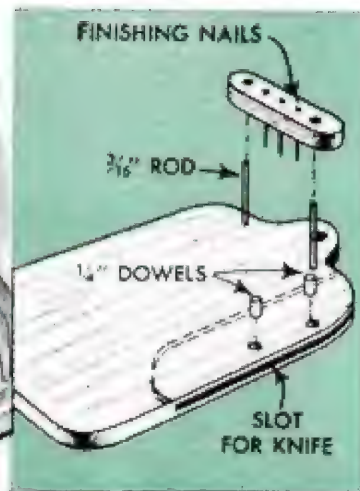
For comfortable sleeping, park car or pitch tent in level spot



To improvise dishpan, cover hole in ground with oilcloth and fill with water



Wooden Scaling Board Holds Fish Securely



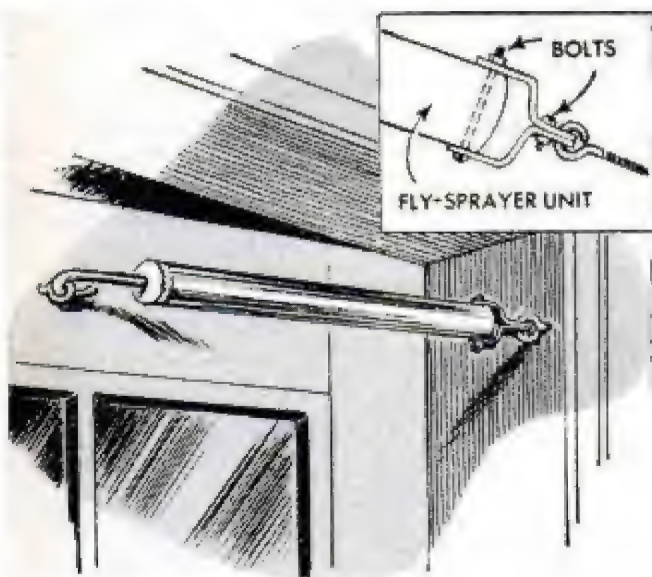
This handy fish-scaling board clamps the fish in place to simplify cleaning, and also features a built-in knife sheath. After cutting a well-seasoned board to the shape pictured, slot one edge to form a knife sheath and drill for the clamp guides, sheath pegs and wall hanger. Then sand the board thoroughly and apply a liberal coat of linseed oil. The clamp consists of a small hardwood block drilled to slide down $\frac{3}{16}$ -in. rods. Finishing nails which engage the fishtail are filed to a sharp point and driven through under-sized holes drilled in the block, as driving them through the hardwood might split the block.

Shoe Data for Future Reference Marked on Tongue Lining

To provide a future means of checking the serviceability of a pair of shoes, I write the brand name, size, price and date of purchase on the tongue lining. Written either in indelible ink or with a ball-point pen of the type used for marking clothing, this data makes it possible before replacing the shoes to determine readily which brands last the longest and are the best

buy. If the lining is not white, the data may be written on a strip of white, water-proof adhesive tape and applied to the inside of the tongue. This also is useful when marking rubbers and overshoes. In a large family where similar sizes are worn by several children, it's a good idea to include the wearer's initials with the other information.—Andrew Vena, Philadelphia, Pa.

Door Check Improvised From Altered Insect Sprayer



A door check that operates on compressed air can be made by altering an insect sprayer as shown in the drawing. The

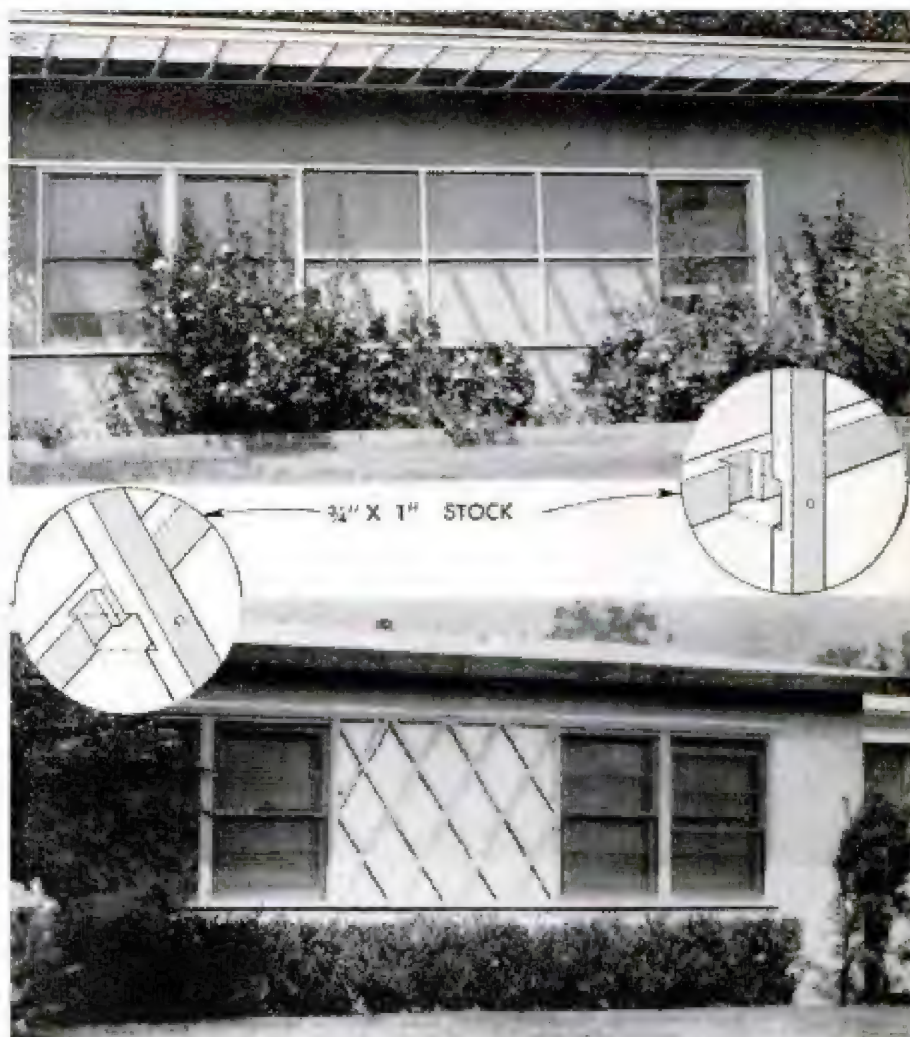
plunger handle is removed, as well as any obstructions on the sprayer tube, and a hook is bent in the end of the plunger shaft to engage a screw eye driven in the door. Two brackets are bolted together, as indicated in the inset drawing, to form a yoke to anchor the closed end of the sprayer tube. Holes are drilled in the ends of these brackets which are slipped over an opened screw eye driven in the doorjamb, the screw eye being pressed closed after the brackets are threaded onto the loop. Then the yoke is bolted to the end of the sprayer tube.—Victor H. Lamoy, Upper Jay, N. Y.

Reinforcing Roof Patch

If a roofing-cement patch in a composition roof breaks open, cover the break with a piece of screen wire that overlaps the damaged area on all sides. Then spread a thick coat of roofing cement over the wire.

Latticework Relieves Plain Exterior-Wall Area

Bare, unbroken, exterior-wall areas between widely spaced windows in a house can be made interesting by the addition of latticework designs similar to those shown. Such a design also will serve to make the house appear longer, lower and "tied to the ground," an effect long considered very desirable in a house by most architects. Made from $\frac{3}{4}$ x 1-in. stock, the members used in the overlaid design are half-lapped and joined with nails and waterproof glue. The latticework is completed by finishing with several coats of exterior paint, either in the same color as the windows or in a contrasting color. If 1-in. blocks are inserted between the latticework and the wall of the house, the former can be used as a trellis, thus providing an additional decorative effect for the wall.



Hatchery for Fishing Worms Started Easily With Pile of Leaves

By "planting" a little kitchen garbage in a pile of leaves, along with several shovelfuls of dirt containing worms, you can create a handy fishing-worm hatchery in your own back yard. The dirt used can be obtained from soil where worms have been found. The pile is covered with dirt and weeds to keep it from scattering in the wind. Add more garbage from time to time, putting it well inside the pile to lessen chances of attracting rodents. When the garbage and leaves have decomposed,

you not only will have all the bait you can use, but also an excellent compost for your garden. If you wish, use all of the compost but a few shovelfuls, which then can be used to start another hatchery. In winter, the hatchery may be maintained by covering it with layers of burlap, weeds, leaves, straw and dirt to prevent the decaying leaves and garbage from freezing, thus providing a bait supply for ice fishing throughout the winter. — Mrs. Gertrude Springer, Cloverdale, Mich.

Gourd With Opening in Side Provides Attractive Planter

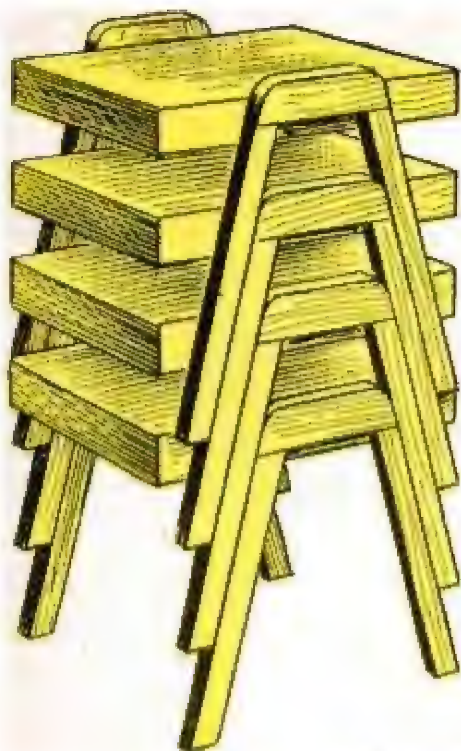


An unusual, eye-catching planter can be made easily from a gourd of the type shown simply by cutting an opening in one side and mounting it on a wooden base. The gourd is attached to the base by means of screws driven through washers from the inside. After sanding the gourd and base, paint them any color that is complementary to the flowers to be grown.

M. M. Ward, Anaheim, Calif.

❑ If you have difficulty fitting a cork in a bottle, run hot water over the bottle.

PLAN of the MONTH...



Many of the problems of entertaining in your home will be simplified when you build this set of nesting tables and chairs. For example, they will put an end to the knee-balancing of plates, a traditionally annoying part of every buffet supper, by providing your guests with ample table space for their plates and cups. Best of all, perhaps, is the nesting feature of this set, which cuts storage space to a minimum. Designed exclusively for *Popular Mechanics* by John Bergen, the set features clean, modern lines and simplicity of construction. The plans show all details clearly. It should be noted that the webbing is applied to the chairs before the arm and back-leg assemblies are screwed in place. Then when the arm is put in place, a $\frac{1}{8}$ -in. hardwood shim is placed between it and the back post to compensate for the webbing on the seat. The new plastic webbing described in the (Feb.) 1953 issue of *Popular Mechanics* is ideal for use on these chairs. To apply the webbing, draw it around the seat or back members, interlacing and stretching the strips taut, and fold the ends double before tacking to the inside face of the member.



NOTE—CUT PLYWOOD TOP $14\frac{1}{8}" \times 16\frac{1}{8}"$. THIS ALLOWS $\frac{1}{8}"$ OVERHANG. WHEN TOP HAS BEEN GLUED TO APRON, SAND OFF OVERHANG

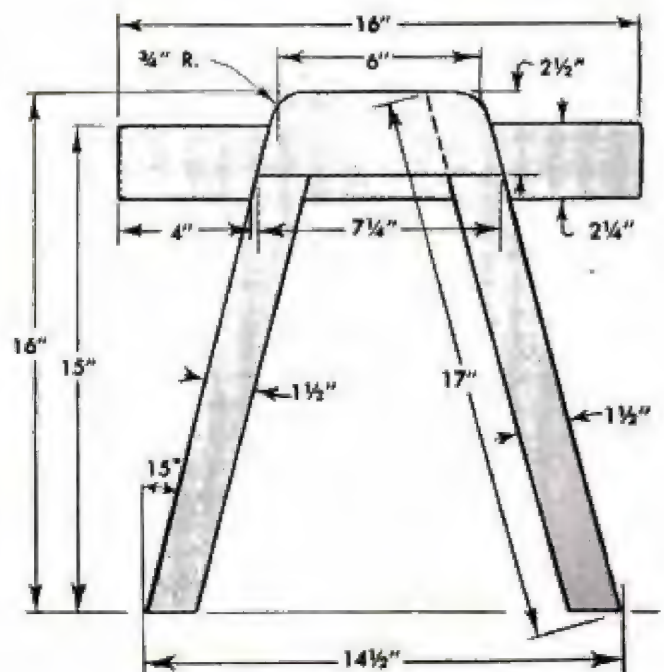
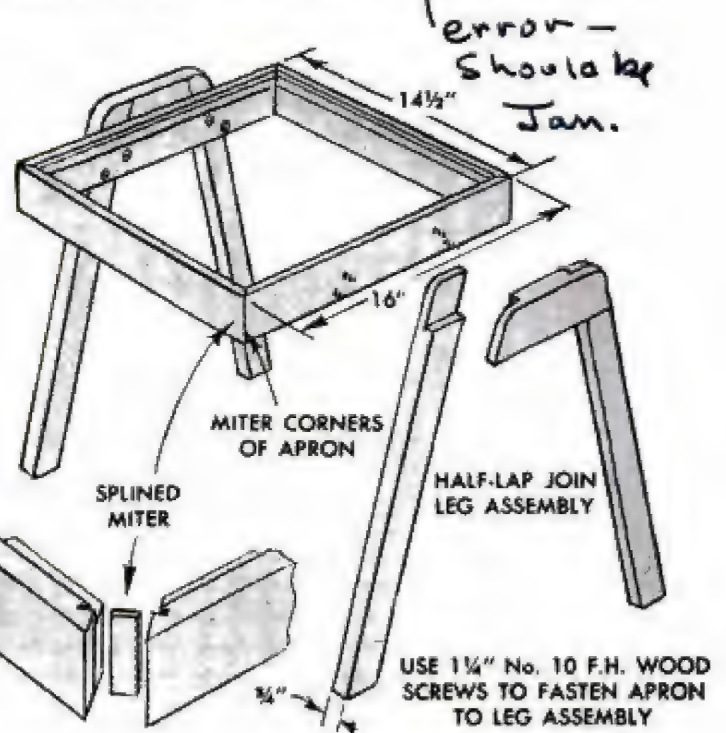
MATERIAL LIST

Stacking Table

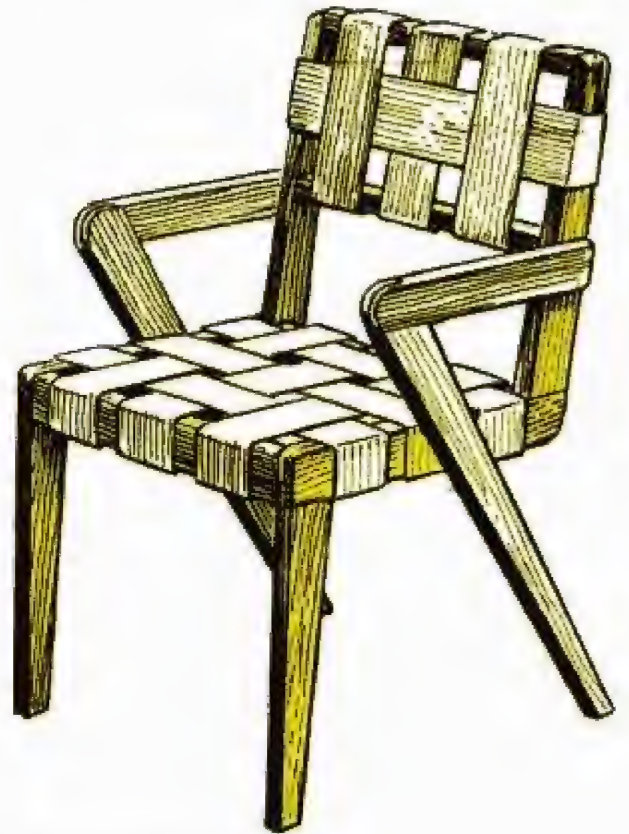
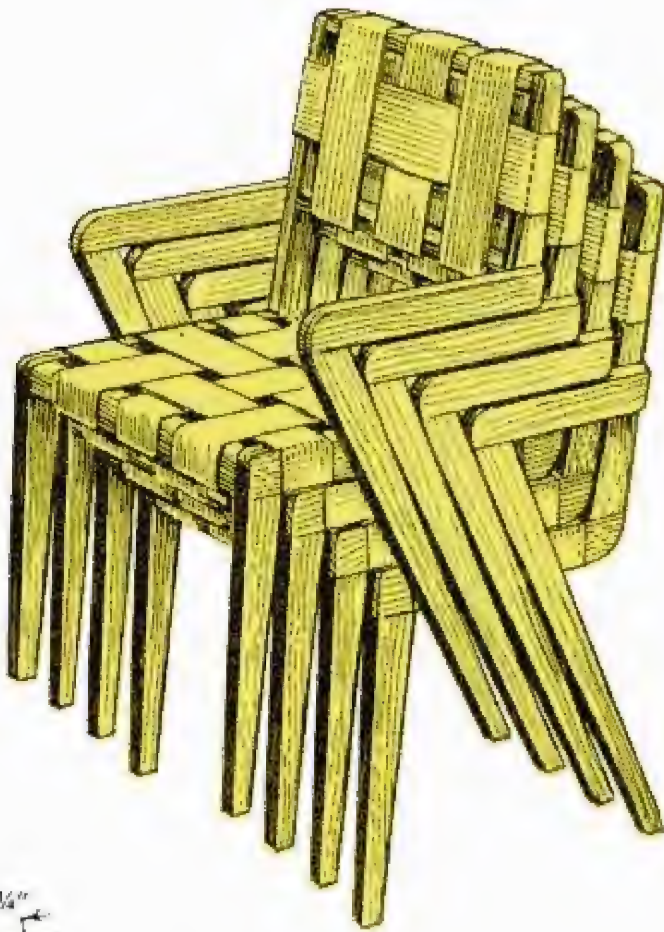
- 1 pc.— $\frac{1}{4}" \times 14\frac{1}{8}" \times 16\frac{1}{8}"$ plywood—Top
- 2 pcs.— $\frac{3}{4}" \times 2\text{-}3/16" \times 16"$ hardwood—Top rails
- 2 pcs.— $\frac{3}{4}" \times 2\text{-}3/16" \times 14\frac{1}{2}"$ hardwood—Top rails
- 2 pcs.— $\frac{3}{4}" \times 2\frac{1}{2}" \times 7\frac{1}{4}"$ hardwood—Leg rails
- 4 pcs.— $\frac{3}{4}" \times 1\frac{1}{2}" \times 17"$ hardwood—Legs
- 4— $\frac{3}{8}"$ dia. glides

Stacking Chair

- All lumber listed is hardwood
- 1 pc.— $1" \times 1\frac{1}{4}" \times 20"$ —Top back rail
- 1 pc.— $1" \times 1\frac{3}{4}" \times 20"$ —Center back rail
- 2 pcs.— $1" \times 2\frac{1}{2}" \times 20"$ —Front and back seat rail
- 2 pcs.— $1" \times 2\frac{1}{2}" \times 17\frac{1}{2}"$ —Front legs
- 2 pcs.— $1" \times 2\frac{1}{2}" \times 17\frac{3}{8}"$ —Side rails
- 2 pcs.— $1" \times 2\frac{1}{2}" \times 29\frac{1}{2}"$ —Back legs
- 2 pcs.— $1" \times 2\frac{1}{2}" \times 19\frac{1}{4}"$ —Back posts
- 2 pcs.— $1" \times 2" \times 16"$ —Arms
- 4— $\frac{3}{8}"$ dia. glides
- 15 yd.— $3"$ or $3\frac{1}{2}"$ decorative webbing

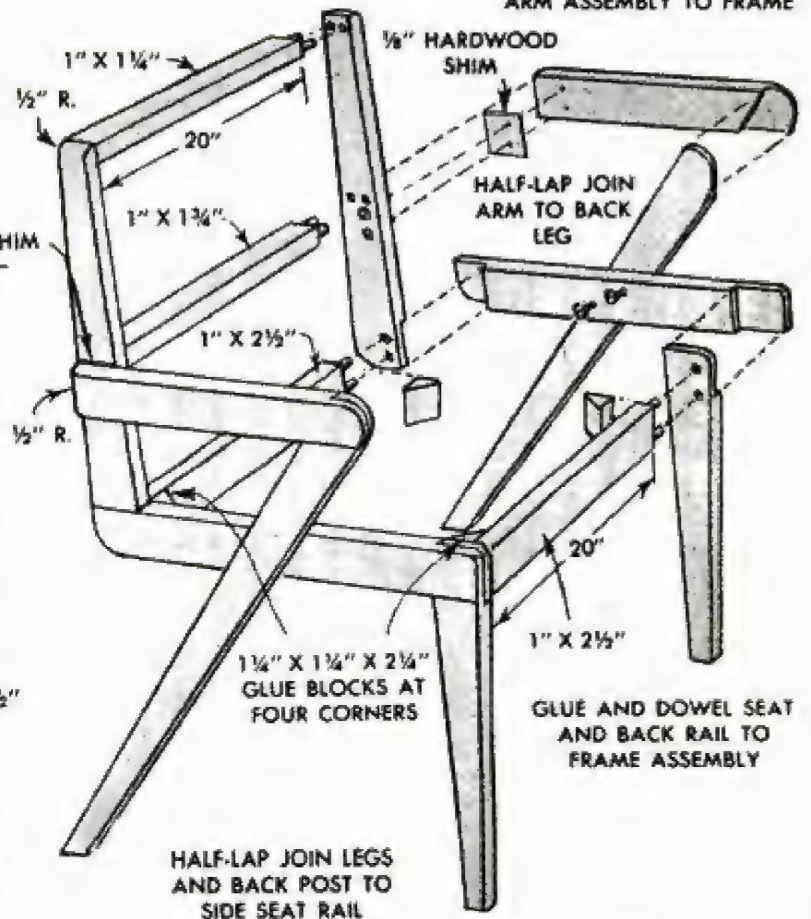
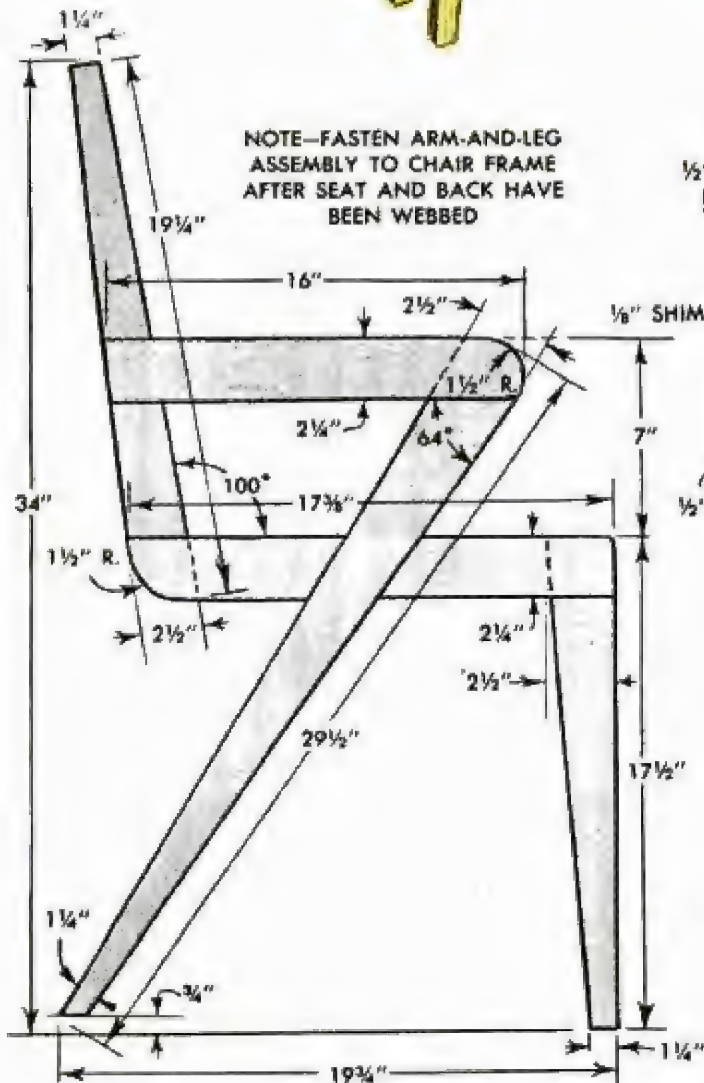


...Nesting Tables and Chairs



SEAT-AND-BACK WEBBING IS
WRAPPED AROUND FRAME MEM-
BERS AND TACKED TO INSIDE
FACE

USE $1\frac{1}{4}$ " No. 14 F.H. WOOD
SCREWS TO FASTEN LEG-AND-
ARM ASSEMBLY TO FRAME



NOTE—ALL STOCK FOR CHAIR
1" THICK



Watch Stored Safely in Pouch Made From Powder Puff

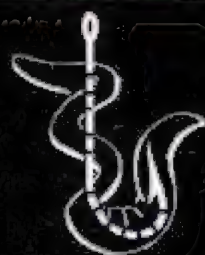
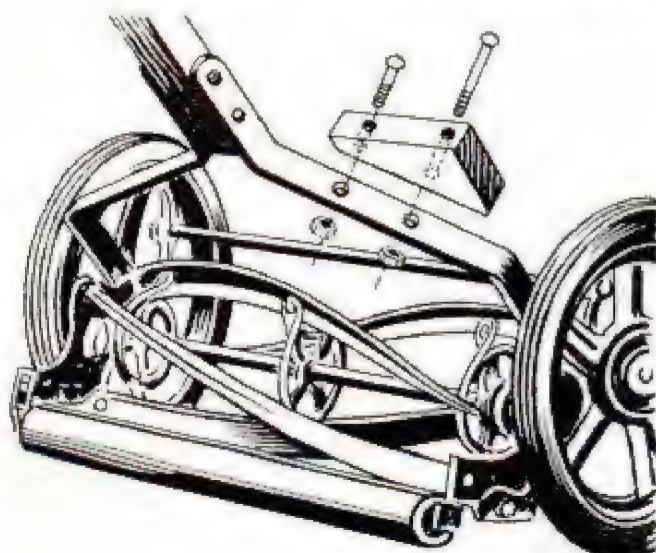
Whether storing or packing a watch or pieces of small jewelry for travel, you can protect them from nicks and scratches simply by slitting open one end of a powder puff and inserting the articles in the pouch thus formed. Use a razor blade or sharply pointed scissors to separate the material. The opening then can be sewn together or closed with a safety pin so that the articles are prevented from falling out of the pouch.

John J. Rea, Urbana, Ill.

Footrest on Lawn-Mower Brace Aids Cutting Tough Grass

If it's necessary to give your lawn mower an occasional boost with your foot when mowing tough grass or hitting a twig, a footrest screwed to one of the handle braces will enable you to use your foot without it slipping off. The rest consists of a triangular block bolted to the brace as indicated. It is a good idea to cut the block from hardwood so there is less chance of it splitting under extreme pressure.

Mrs. T. F. Watts, Charlotte, N. C.



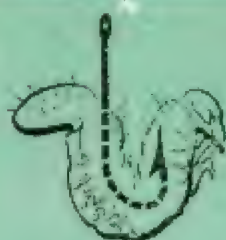
Worm looped on body of hook in this manner takes panfish regularly. Equally effective in both quiet pools and fairly fast water and can be fished shallow when required

For still fishing, hook a minnow just back of gills. Be sure hook point is forward, as game fish take bait head first because of standing dorsal fin



Tadpoles hooked back of head are among the most active and effective live baits. While attractive to panfish, they will be taken by bass in streams

Often you can fool a black bass or even a wily trout with a caterpillar hooked as shown. One trick in baiting with a caterpillar is to be sure hook point is concealed

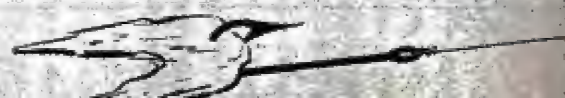


Few fresh-water game fish can resist a grub if hook is carefully concealed. While not lively like other insect baits, grub is easily seen even in slow, turbid streams

Trolling with a clam often takes fish when all other lures fail. Pass hook entirely through thick end of meat so that the thin end trails realistically



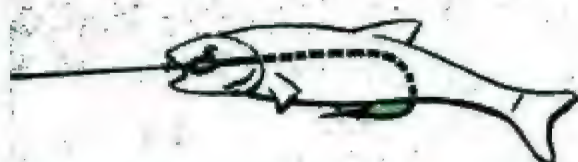
For casting, slice clam into a thin strip. Slit one end of the strip as shown. Then hook just above open strip with the point of the hook exposed



...HOW TO HOOK BAIT



When still fishing, hook the clam meat so that it conceals the point of the hook. When fishing with small hooks, it's best to cut meat into small pieces



When trolling or casting a minnow remember that fish will strike from behind bait, either coming in at angle or upwards. Locate hook as shown

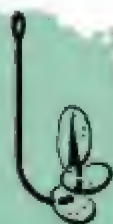


When still-fishing a frog, hook behind the neck and under the backbone with point of hook facing forward. Effective method for small leopard frogs



When trolling with a frog, hook through lips with the barbed point of the hook up. Frog is extremely active when hooked in this manner

To prevent nibblers from stealing a worm, cut the worm into several pieces and hook these separately. When baiting in this way it's important to conceal barb of hook

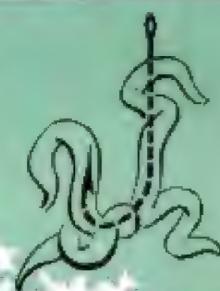


When baiting with fish eggs cover point of the hook with two or three, depending on size. Eggs used for bait should not be permitted to dry

For still fishing, hook crayfish through the body with hook at a slight angle so that barb projects upward and forward. Small crayfish are preferable



Cover large hooks with two or more worms so that both point and body of hook are well concealed. Wiggling ends attract feeding fish from a distance in clear water



When fishing a worm among weeds or lily pads, hook with ends of worm projecting. Then force end of barb into one of the free ends

When you drop a live cricket onto the surface of a quiet pool you'll probably hook a panfish, but be prepared for a lurking bass. If he's there he's sure to be tempted



Cockroaches (when you can catch them!) make live baits equal in effectiveness to grasshoppers, crickets. Hook through body just back of neck

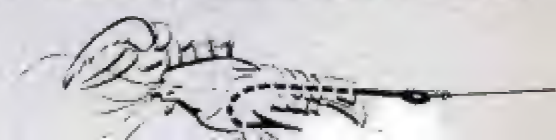


Grasshoppers are old stand-bys of all live-bait fishermen. Few game fish will pass up a grasshopper when hooked through back behind neck

"Cat" fishermen generally consider dough balls the best bait for catfish, especially when pole-fishing in rivers, ponds



For trolling, hook the crayfish under the hard shell of the tail, then turn the hook so that the barbed point projects downward and outside the body



TRICKS FOR TWO



This one takes teamwork — two people using a hand opiece as they attempt to tie same parcel

Scoring "baskets" with table-tennis balls in strainer held as shown grows difficult as throwing distance is increased

Indoor game of quoits can be set up in a matter of seconds. All that's needed are a pop bottle and rubber jar rings

Ten points are scored for every penny dropped into milk bottles while leaning over chair backs. Partners can compete with others

This one's ideal for competing couples. Partners' spoons are tied together with 12-in. string, while two dishes of ice cream are placed 18 in. apart. Object is to see who can finish first without breaking string



For a real test of your balancing skill, try folding a card table on which a cup or glass of water has been placed without spilling any of the water



In this stunt, contestants take turns using knives to remove salt from pile that supports egg on end. Whoever eventually causes egg to topple is loser



Above, contestant's attempt to blow table-tennis ball between opponent's clothespin "goal posts" in water-filled pan. Below, trick is to blow feather from eyebrows without moving head or wrinkling brows



Above, oranges passed between contestants without touching them makes hilarious race for group divided into teams. Below, fun for all is provided by blindfolded girl's reactions when touching dried oats, fresh oysters, spaghetti, etc., in dishes

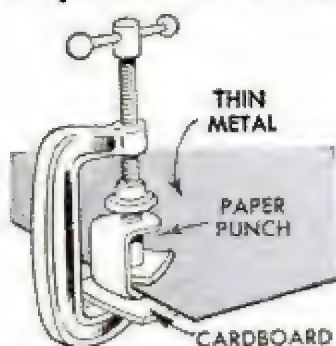


Bolt Inserted in Pipe Stake Protects End When Driven



When pipe lengths used as survey stakes, ground rods, etc., are driven with a hammer or steel maul, the ends of the stakes usually become "mushroomed," leaving jagged edges dangerously exposed above the ground. This can be avoided simply by inserting a large carriage bolt or automobile valve stem in the end of the pipe to absorb the hammer blows.

Paper Punch Perforates Metal



A small paper punch may be used to perforate light-gauge metal if used in a C-clamp as shown. A piece of cardboard is placed under the punch to prevent the cutter from coming in contact

with the clamp. When the screw of the C-clamp is turned, the punch will cut through the metal. Although this operation will dull the punch too much for effective use again with paper, it is inexpensive to replace.

Frank Shore, New York City

Brush Technique Important To Final Painting Results

The final appearance of a painted wall surface will depend to a great extent on the way you handle the brush while doing the job. One large paint manufacturer recommends that you start painting at the ceiling and work down the wall in 3-ft.-square sections, cross-brushing horizontally and finishing with vertical brush strokes toward the ceiling. Completely finish a 3-ft. strip from ceiling to baseboard, repeating the en-

tire process until the wall is finished. In painting ceilings, complete a similar 3-ft. strip across the ceiling, making sure that the final brush strokes all run in the same direction. Work in 3-ft. strips across the ceiling until it is completely covered.

Clothespin Serves as Reel For Extra Fishline

To keep extra lengths of fishline from becoming tangled when carried in a tackle box, wrap them around a spring-type clothespin. Clamp one end of



the line in the jaws of the clothespin and, after wrapping, open the jaws slightly and clamp the free end between them.

Thomas P. Ramirez, Fond du Lac, Wis.

Bearing Shimmed Temporarily With Aluminum Foil

Loose bearings, which cause loss of oil in an automobile engine, can be temporarily repaired with tin or aluminum-foil shims, as shown in the illustration. The shim is built up in several layers under the bearing insert. The first shim should be the same length as the back of the bearing insert and the next shim should be about $\frac{1}{2}$ in. shorter at each end. If a third shim is necessary to take up the looseness, it is cut shorter than

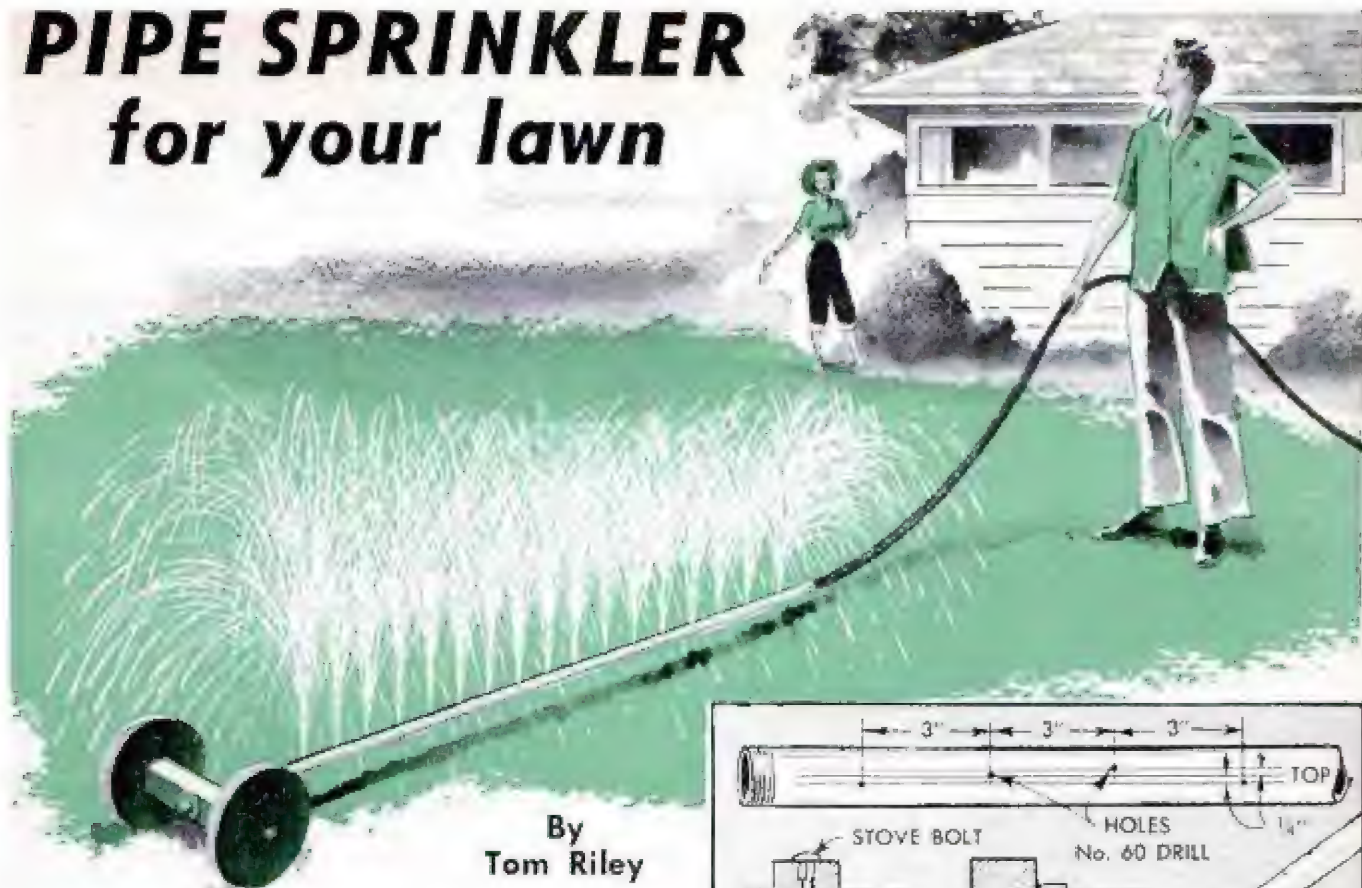


the second one. Care should be taken to see that the shim does not plug any oilholes. Note that if the bearing itself is in bad condition, it should be replaced.

Ed Packer, Chicago.

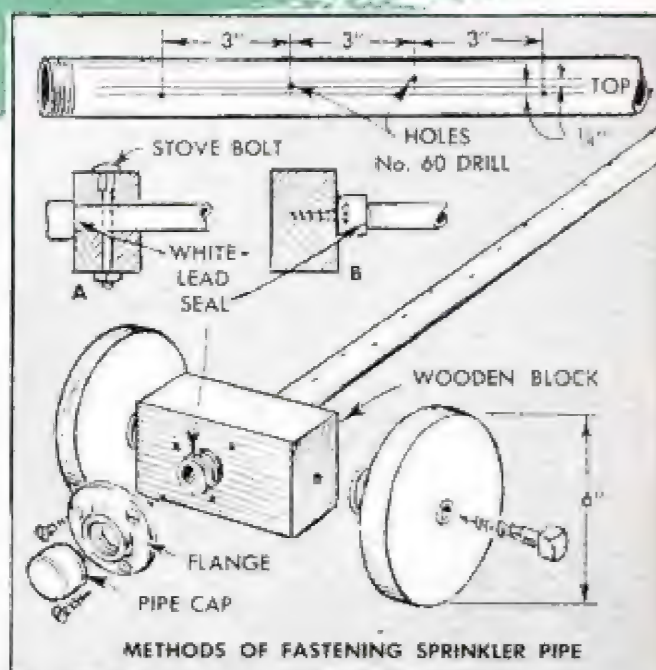
❏ If soap and water fail to remove the last traces of fresh iodine spots on varnished wood, apply a little alcohol or ammonia solution with a soft, clean cloth.

PIPE SPRINKLER for your lawn

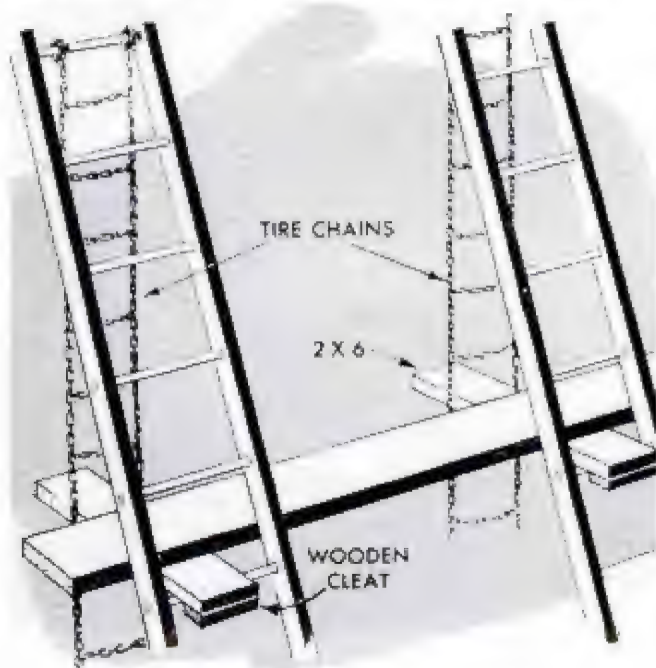


By
Tom Riley

A LAWN SPRINKLER that will water large areas with few settings can be made by attaching wheels to a drilled length of $\frac{1}{2}$ -in. galv. water pipe. The wheels are mounted to a 6-in. length of 2 x 3 lumber with 2-in. lag screws. The wheel assembly is then secured to the capped end of the pipe by any one of the three methods shown. To space sprinkler holes evenly, scribe three lines $\frac{1}{4}$ in. apart along the length of the pipe. Using a No. 60 bit, drill alternate holes 3 in. apart as shown. For added convenience, use a pipe the same length as garden rows or major lawn areas.



Improved Scaffold Suspended From Extension Ladders



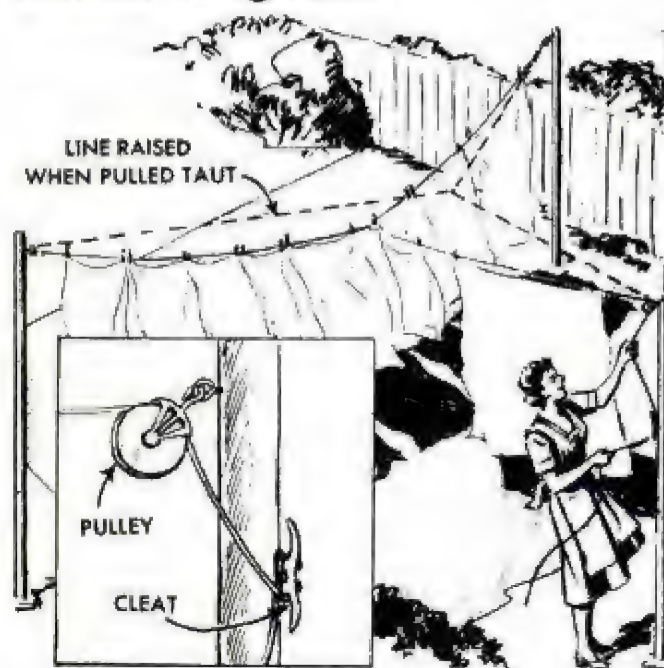
Here is a simple scaffold that can be erected quickly by the homeowner-handyman for painting or repairing exterior walls. Suspended beneath extension ladders placed 5 or 6 ft. apart, the scaffold plank is supported at each end by a short length of 2 x 6 having a cleat at one end to hook over a ladder rung. The other end of the 2 x 6 is supported by a tire chain suspended as shown from a rung directly above.—C. Victor Johnson, Bristol, Conn.

Storing Assorted Screws

Screws of assorted sizes left over from various jobs can be stored together for future use by pressing them into a piece of cardboard. When hung on the wall of a workshop, the cardboard permits quick selection of the screws.

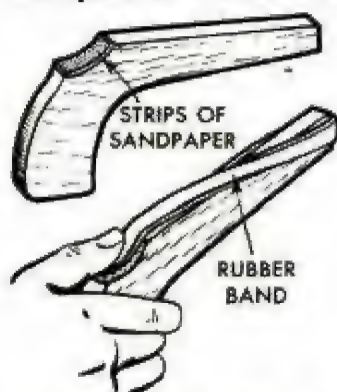
Charles Harris, Kingston, Ark.

Clothesline Made Taut Without Using Poles



You'll find it a simple matter to arrange two clotheslines so clothes poles will not be required. To do this, first stretch one line between two posts or trees so it is fairly slack, and then tie one end of a second line to the middle of the first. Then the second line is brought over to a pulley attached to a third post or tree as indicated. After clothes have been hung on both lines, the second line is drawn taut to take up slack in the first line and secured to a cleat.

Simplified Rubber-Band Gun



Requiring no clothespin trigger or other mechanical means for "firing" it, this simple rubber-band gun will be easy for any boy to saw or carve from a single block of wood. All that's necessary is to glue a strip of sandpaper in the depression where the trigger ordinarily is located. In use, the rubber band is placed over the end of the barrel and the ends drawn back to the sandpaper where it is held with the thumb in the manner shown.

Restoring Rain-Soaked Hat

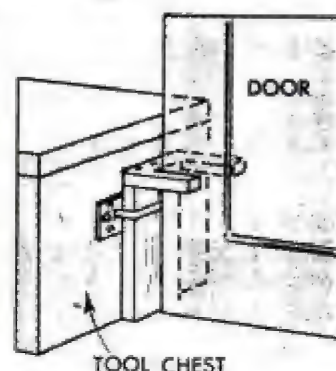
To restore the appearance of a felt hat that has been soaked in the rain, first let it dry partially and then press out the creases in the crown. Next, turn down the band and place the hat in some cool place away from any heat and let it dry thoroughly.

Then reshape the crown and brush the hat gently. If the work has been done carefully, the hat will look almost as good as new.

Blanche Campbell, Las Vegas, Nev.

Jig Anchored by Tool Chest Holds Door for Planing

Inserted in the handle of a heavy tool chest, this U-shaped jig will support a door on edge for planing or lock-fitting. Made from scrap hardwood or plywood, the jig consists of a horizontal piece which is notched to receive the edge of the door and nailed at a right angle to the upper end of a vertical piece. The latter should be sufficiently wide and thick enough to fit snugly in the chest handle.



Rivets of Varied Sizes Set in Bench Vise

By utilizing the power of a bench vise, you can do a neater, more professional job of setting small rivets. To do this, first cut two pieces of angle steel so one web is about an inch longer at both ends than the width of the vise jaws. The ends are then bent at right angles to the jaws as shown. Next, line up the two pieces, clamp them together and drill a $\frac{3}{8}$ -in. hole through the center of each. The setting dies are short lengths of $\frac{3}{8}$ -in. steel rod. After the die faces are turned to shape, the dies are forced into the holes in the angle-steel pieces by pressure applied with the vise jaws. Press-fitting the dies should be sufficient, but welding them in place is advisable if long service is anticipated.



HOW TO RIDE A HORSE

By Norb Hildebrand and Vories Fisher

THE HORSE, long eclipsed by the auto as a means of transportation, is again coming into its own for riding as a sport. The popularity of horseback riding, as evidenced by hundreds of riding clubs being formed all over the country, will bring many inexperienced persons into this sport, which can be enjoyed by the small fry as well as adults. Even a child of eight is old enough to learn to ride a horse, according to Mrs. Frances Farwell Reker, holder of three diplomas from specialized-horsemanship schools, who speaks from many years of experience in teaching children to ride.

One of the first points in learning to ride a horse is not to be concerned about a riding costume. Comfortable-fitting jeans and an ordinary shirt found in most anyone's wardrobe are entirely suitable. Low shoes with normal heels for street wear also are satisfactory, but shoes without heels are not. The loafer-type shoe is likely to fall off during the ride while the heelless shoe is apt to slide all the way through the stirrup.

Mrs. Reker prefers the hornless English-type saddle for the beginner, who thus learns to be independent of the horn as a "grab bar." Once the student has mastered the poise and balance necessary with the English saddle, he is ready for any type of saddle.

The first step in practical horsemanship is concerned with vocabulary—not only nomenclature concerning the horse but that of the equipment as well. Various parts of the horse are named in



WALK 4 M.P.H.



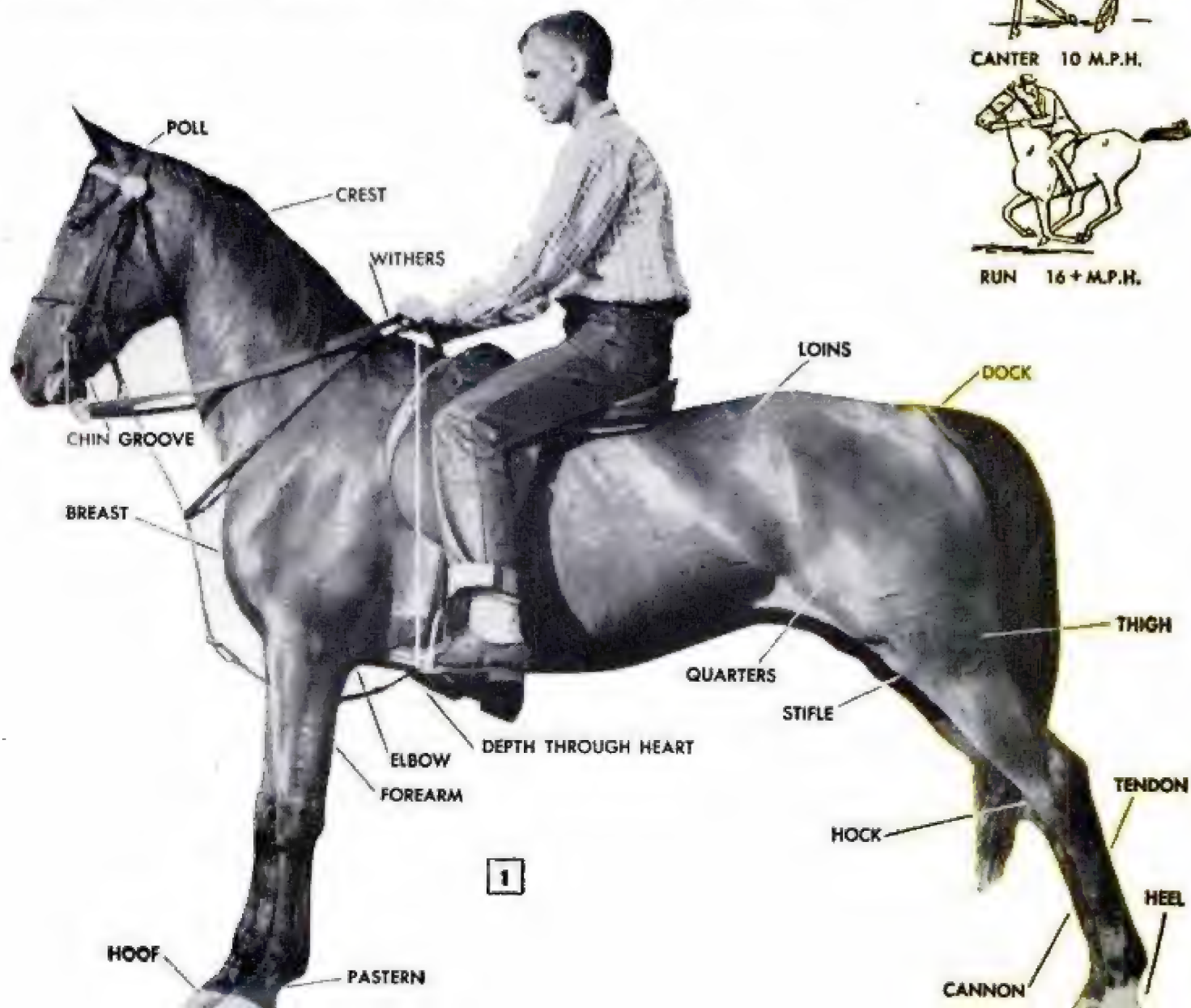
TROT 8 M.P.H.



CANTER 10 M.P.H.



RUN 16 + M.P.H.





Reins are held without twisting in loosely clenched fists. Hands and arms are positioned as in the photo

Fig. 1, while those of the bridle and saddle are identified in the drawing on page 175. The manner in which a horse moves is known as a gait. Four of the more common gaits and their approximate speeds in miles per hour are shown above Fig. 1.

Handling a horse involves the physical, mental and even emotional natures of both horse and rider. The physical-control aids of the rider—his legs, hands, voice and weight—must mesh properly at all times. Any one of them not properly used will only confuse the horse and, in the case of a high-spirited animal, may throw him off his good behavior. The control aid most likely to get the rider into trouble when misused is the voice. Any uncertainty, fear or lack of self-confidence in the rider will be apparent in his voice, and the horse will react readily to the emotion engendered in the voice of the rider. The other aids to control, the legs, hands and weight, are simply a matter of physical coordination common to any sport.

The rider should always approach the horse from the left side. Control of the animal is assumed by grasping the reins, free of snarls, in the left hand, after which his first inspection concerns the saddle. Extending around the horse's barrel is a wide band, known as the girth, which holds the saddle in place. Occasionally, when the girth is pulled up, or cinched, Fig. 5, a horse will resist the pressure of this belt and fill his lungs deeply with air in order to cheat the confining pressure of the girth. Thus a girth may appear to be drawn up tightly, but when the rider puts some weight into the stirrup, the saddle may turn. To check the girth, the rider should try to insert a forefinger under the girth strap below the

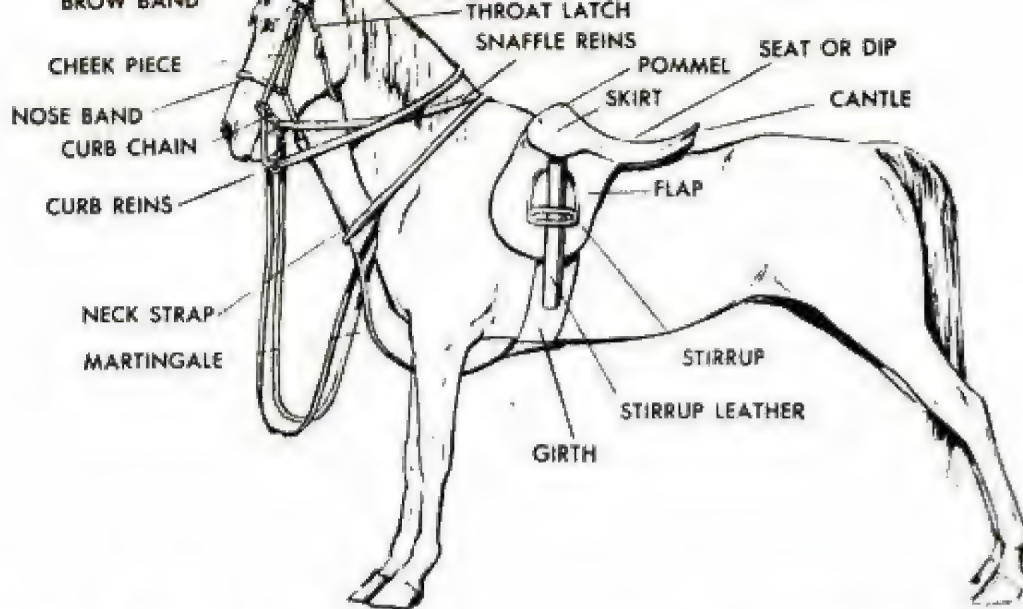


Girth is properly tightened when finger is snug fit under it, as above. It's too loose in photo below



stirrup level. If the girth is snug on one finger, as in Fig. 3, it is correctly adjusted. If the girth can be pulled out easily, Fig. 4, it's too loose and the saddle will slip. If the finger can't get under the girth, it's too tight and will gall the horse even if it doesn't interfere with his breathing.

The next inspection concerns the stirrups. Straps, or leathers, should be flat and adjusted to proper length which will vary for different riders. To make a preliminary check, the rider rests his right palm on the saddle with his right arm straight. The stirrup iron, which is held in the left hand, should extend to the armpit as in Fig. 6. This test will hold for anyone in the late teen-age or adult-rider group having an average arm length. For children or those with shorter or longer arms than average, the check must be made when the rider is in the saddle. Adjustment of the stirrup length to suit is made by shortening



ENGLISH SADDLE



WESTERN SADDLE



5

Adjusting tightness of girth, as above, is important to keep saddle from slipping off horse's back



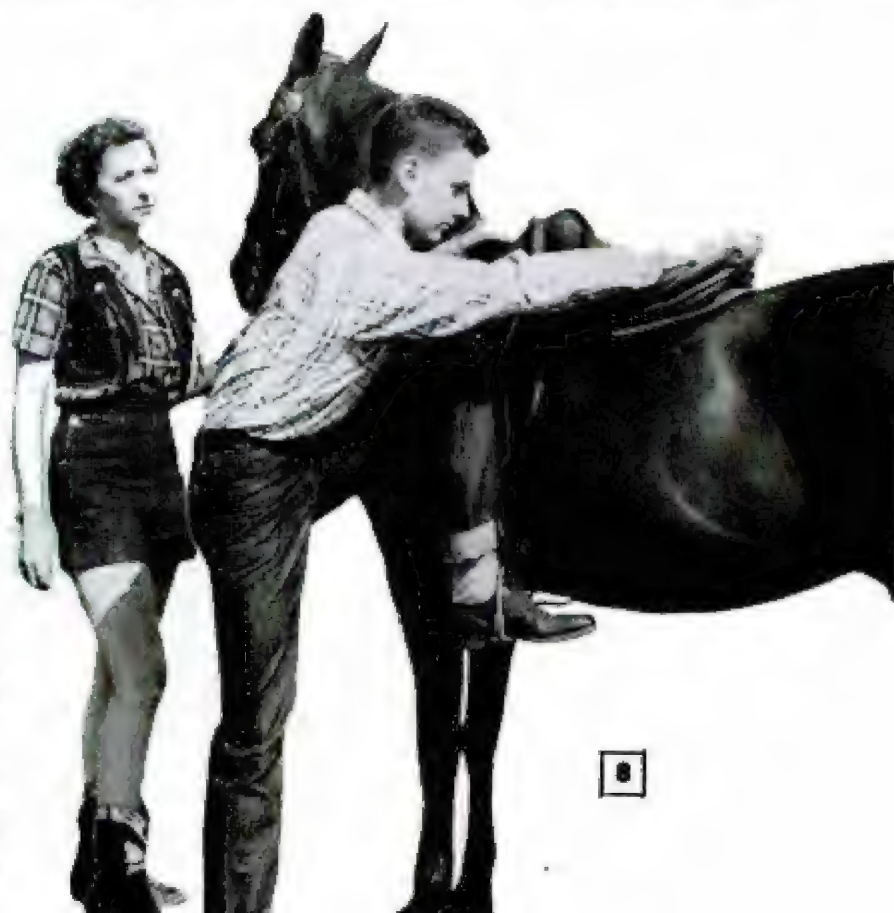
6

Stirrup is just right length for rider when, with his right hand on saddle, stirrup reaches armpit



7

Wrong way to mount horse is pictured above. If horse begins to move, rider cannot swing into saddle and must hop along on one foot



8

When rider mounts from position shown at the right, he can swing himself easily into the saddle even though horse should move forward



Right leg is swung high enough to clear both horse and saddle, above, being careful not to hit the horse with knee as in right-hand photo



Weight of the rider should be carried in the seat, or dip, of the saddle, as in the left-hand photo. Back should be held erect

Right-hand photo illustrates two common errors. Rider's weight is carried by rear of the saddle and his hand grips pommel



When rider has mounted, stirrup length is double checked. Stirrup iron should reach ankle, left. Wrong leg position is shown in center photo, while right-hand photo pictures correct heel-down position of leg



or lengthening the stirrup leather.

The rider is now ready to mount. Facing squarely to the rear of the horse, Fig. 8, the rider places his left hand, holding the reins, palm down over the withers. The right hand is placed on the cantle of the saddle. The position of the hands in this way, one on the horse and one on the saddle, will distribute the weight of the rider between the two. Otherwise, the saddle would bear the entire weight and even though the girth has been tightened properly, the saddle might slip.

The left foot is now placed in the stirrup, which is first given a quarter turn to the right. From this position, the rider swings up and over with the right foot, Fig. 9. The foot should clear the horse as it comes over, not brushing the animal as in Fig. 10. Meanwhile, the right hand is moved from the cantle to the pommel of the saddle. The right foot is then inserted in the right stirrup.

Mounting in this fashion insures the rider's safety at all times. With the reins held by the left hand, the animal is under control. Should the horse start forward or even take just a step as a nervous animal might do, the rider is in a position to swing into the saddle. If the rider were facing to the front of the horse, as in Fig. 7, any forward motion of the animal would leave

Rider brings horse to a halt by leaning backward in saddle and applying an even pressure on both reins. Same procedure is employed to make horse back up

the rider hopping helplessly on one foot.

Once mounted, the rider's weight should be firmly in the dip of the saddle, Fig. 11, not toward the rear of the saddle as in Fig. 12. Knees are held inward gripping the saddle lightly. The balls of the feet rest on the stirrup iron, Fig. 15, with the heels down. Note common mistake in Fig. 14. If the rider will glance down without changing his body position, he should see about an inch of toe beyond his kneecap. To check on correct stirrup length, with the foot out of the stirrup, the iron should hit the anklebone, Fig. 13. The stirrup leathers should be flat against the leg, not twisted as in Fig. 17, as they will cut into the rider's leg from the motion of the horse.

The hands should grasp the reins lightly but firmly, holding the reins straight without twists or dip. They should be held taut but without pressure. The hands are held in a loosely closed fist with the reins inside the fingers, coming out between thumb and forefinger as in Fig. 2. Note that the elbow is held at the side with the forearm and fist forming a straight line.

Starting the horse is accomplished by heel pressure applied on both sides just behind the girth; at the same time the rider leans slightly forward. Be careful not to exert backward pressure on the reins as in so doing the horse is being told to go forward and to stop at the same time. The degree of pressure will vary with different horses from a nudge to a sharp contact.



When placing feet in stirrup irons, be sure that leathers are not twisted, as below. This condition will cause sore legs in a very short time





To turn horse left, pull on left rein, bringing right arm forward to release pressure on right rein. If you retain some pressure on right rein, horse becomes confused

18



19

To dismount, place left hand on withers and right hand on side of pommel, as above. Then shift the weight of the body to the hands, as right hand is moved simultaneously to dip of the saddle, below



20

Dismounting with both hands on saddle, above, not only is awkward but will be likely to cause the saddle to slip. Below, with body weight shifted to hands, the left foot is removed from the stirrup



21



22

Either way, however, it must be a decisive action which shows the horse that the rider means business.

To turn to the left, whether the horse is moving or standing, the rider guides his mount in the desired direction by pulling back with the left rein while extending the right arm forward so the horse may get his head round, Fig. 18. To turn right, pull the right rein and give with the left.

A horse will normally walk at his first "heel command" and will change to his next speed, a trot, the second time pressure is applied. Before trotting, the rider should prepare his mount for the command by

shortening the reins a few inches. To stop the horse, from any gait, the rider leans backward and exerts an even pull on both reins as in Fig. 16.

To dismount safely, the horse is first brought to a standstill. With the reins again in the left hand, which is placed palm down on the withers, the right hand is placed on the right side of the saddle pommel. The right foot is then swung out of the stirrup, Fig. 19, and over the back of the horse with the rider's weight on the left stirrup. The right hand is now placed in the dip of the saddle and the rider leans forward over the saddle placing his entire weight momentarily on both hands, Fig. 21—not as in Fig. 20. Now, taking his left foot out of the stirrup, Fig. 22, the rider slides down to the ground, landing with his knees slightly bent to act as a shock absorber, Fig. 23.

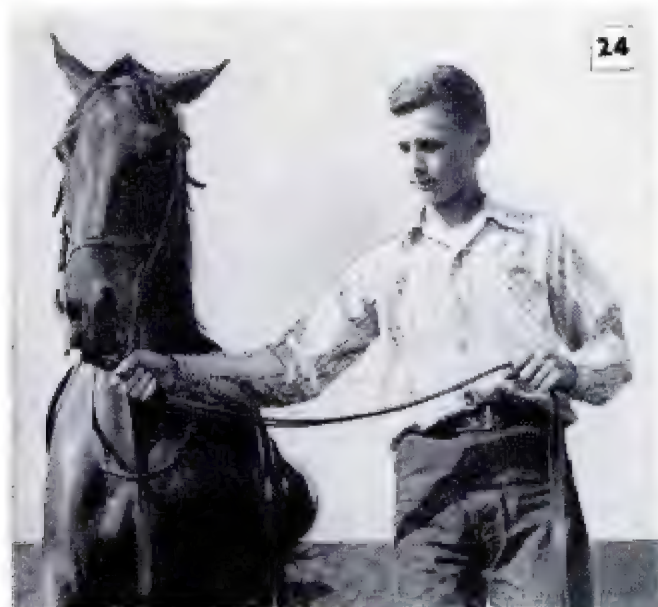
Leading the horse is done from the left side of the animal. To properly and safely lead the horse, the rider grasps the reins with his right hand close up under the bit. The left hand holds the balance of the reins, with a reasonable amount of slack, and provides a safety grip in case the right hand should lose control. In this way there is no possibility of the horse biting the rider, and the horse may be led easily in any direction. In addition, holding the free ends of the reins in the left hand keeps both horse and rider from stepping into the reins.

Before returning the horse to his stable, the stirrups should be run up the stirrup leathers. This is done by pushing the stirrup iron up the lower leather as high as it will go and then tucking all the stirrup leather behind and under the iron, Fig. 25. Thus, the stirrups don't dangle to the annoyance of the horse as it walks, and the saddle may be removed more easily. ★ ★ ★



To keep control of the horse, reins are still held firmly in left hand as rider drops to the ground. Note how the rider flexes knees slightly

Lead horse from left side, grasping reins with right hand just below bit. Holding ends of reins in left hand prevents losing control if horse pulls away

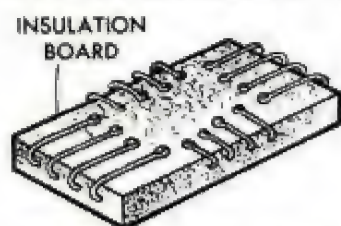


Soldering-Iron Tip Cleaned On Padded Glove



Many craftsmen who work with sheet metal frequently will clean the point of a soldering iron by wiping it across a leg or sleeve of their coveralls, eventually scorching and damaging the fabric. To eliminate this practice, one worker pins a cloth pad to the back of a glove which he wears on one hand when soldering. With the fingers removed or left intact, as desired, the glove causes no inconvenience when worn while working. When the pad becomes badly scorched, it simply is removed and replaced with a new one.

Insulation Board Holds Fishhooks



A scrap piece of soft insulation board, either square or rectangular in shape, will hold more fishhooks than a number of corks. It will occupy only a small amount of space in the tackle box, or can be carried safely in the pocket. For hooks with leaders attached, use a longer piece and slit one end to receive the leaders.

Cinder Effect for Model Railroad Provided by Coffee Grounds

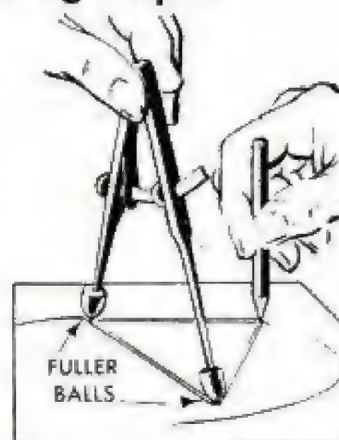
When making miniature-roadbed sections, one model railroader uses ordinary coffee grounds to achieve a realistic cinder effect. The wooden base sections of the roadbed are coated with glue and the grounds are sprinkled over them. If a black roadbed is preferred, partially fill a coffee can with grounds and add a mixture of

water and either India ink or black dye. After putting on the cover, shake the can vigorously and then spread the grounds on newspapers to dry before gluing them to the roadbed sections.

Norm Jacky, Fond du Lac, Wis.

Dividers With Fuller-Ball Stops Used When Drawing Ellipse

Seeking a quick method for scribing an ellipse, one sheet-metal worker found that his dividers with Fuller balls slipped over the points as shown in the illustration, would do the job effectively. The dividers can be adjusted to hold a loop of string at



almost any desired spread while the Fuller balls act as stops to hold the string at the dividers points.

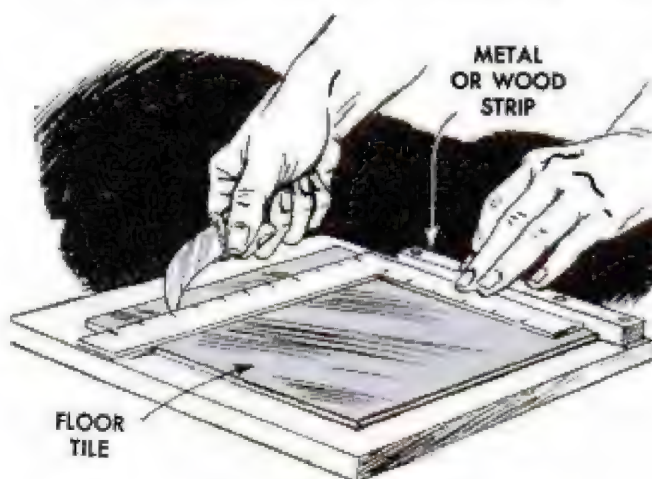
Renailing Baseboard Molding

Quarter-round molding should not be nailed to the baseboards or floor boards, as it will pull loose when either of them starts shrinking, resulting in unsightly cracks. Instead, drive long finishing nails diagonally through the joint and into the plate.

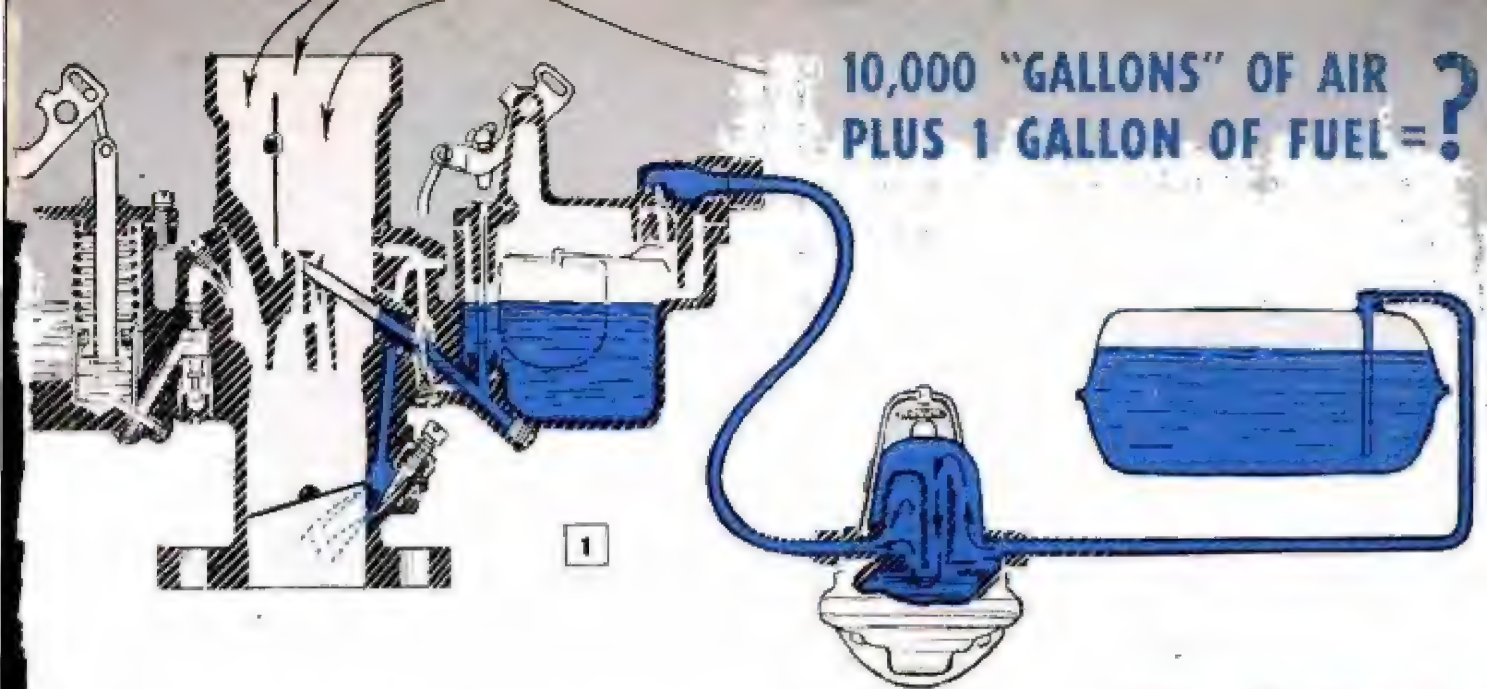
Jig Speeds Cutting of Floor Tile

Finding it difficult to hold a straightedge steady when using it as a guide for cutting floor tile, I made a simple jig by nailing a wooden strip to one edge of a plywood cutting board. Then, using a carpenter's square, I butt one edge of the tile against the strip and place the square over it as shown. In this way, I am able to steady both the tile and the square with one hand while cutting.

James F. Bennett, Lakewood, Ohio.



10,000 "GALLONS" OF AIR ?
PLUS 1 GALLON OF FUEL = ?



152 auto Repair Manual

KNOW YOUR CARBURETOR

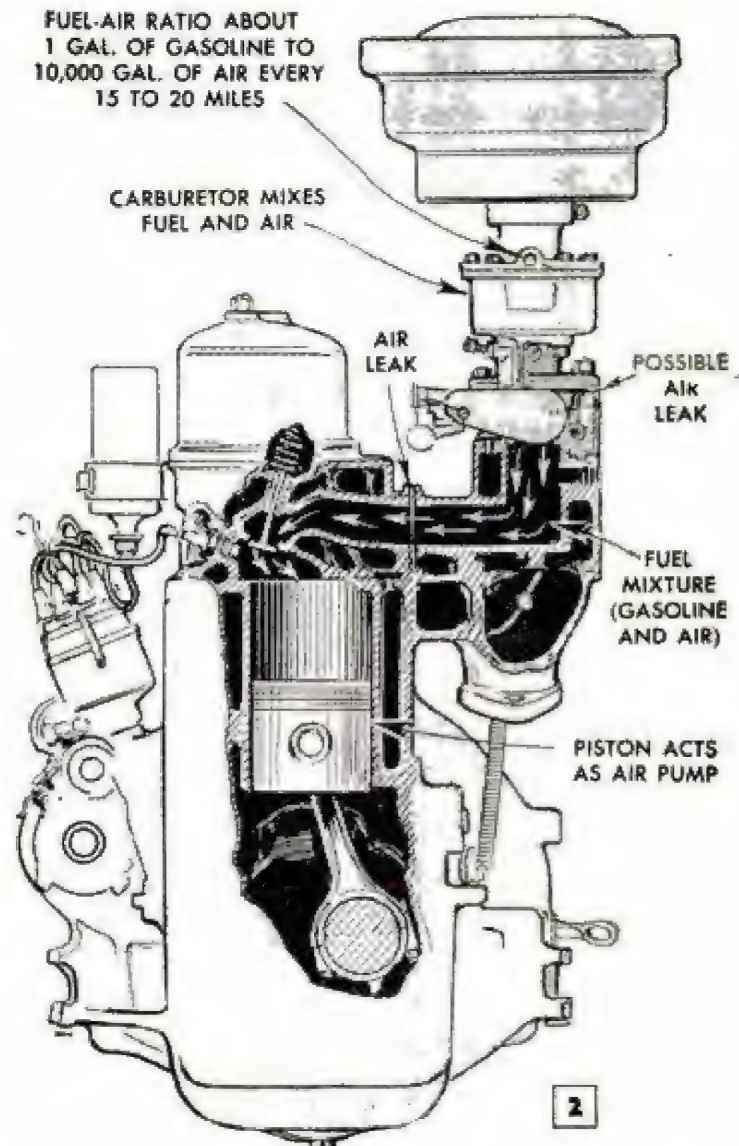
what it is—what it does

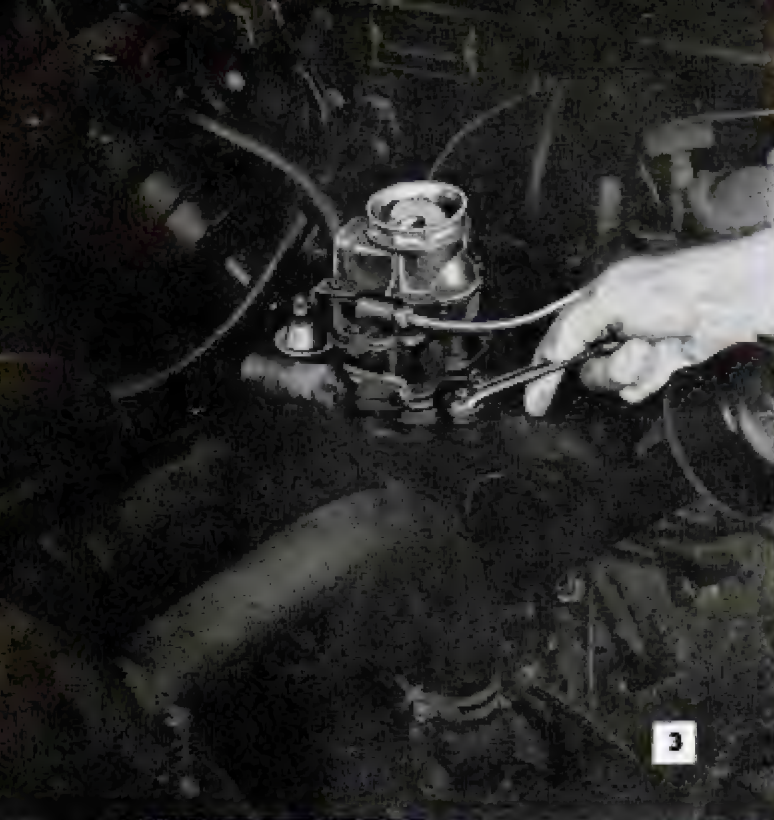
By Ed Packer

IT'S THE JOB of the carburetor to supply your car engine with a correctly proportioned mixture of gasoline and air under operating conditions that may vary widely within only a few miles of driving. The load on the engine varies constantly, the speed of the engine is rarely uniform and under certain driving conditions it is seldom operating at a normal temperature. Smoothness of operation at normal speed ranges, maximum power and the mileage you get from a gallon of fuel are dependent on the correct functioning of the carburetor. If the mixture is even slightly too rich, fuel will be wasted as a small portion will pass through the cylinders unburned because of an insufficient amount of oxygen in the mixture. This unburned portion decomposes in the combustion process and forms carbon deposits in the upper ends of the cylinders and on the piston heads.

Only a very small proportion of fuel is consumed in relation to the amount of air in the mixture. The proportions are approximately those given in Fig. 1, although the term "gallons" is used only for purposes of illustration. The fuel-air ratio is based on weight. The process of mixing fuel and air in the correct proportions is brought about by manifold vacuum, making the engine in a sense an air pump, Fig. 2. On the intake stroke each piston effects a slight change in air pressure, that is, a partial vacuum

FUEL-AIR RATIO ABOUT
1 GAL. OF GASOLINE TO
10,000 GAL. OF AIR EVERY
15 TO 20 MILES





3

An air leak at the carburetor flange can cause the engine to die while idling at the stop light or curb. Often tightening the screws lightly will stop leak

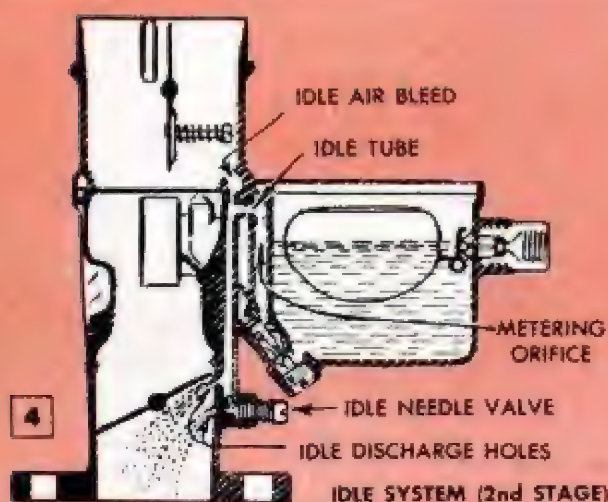
measuring from 18 to 21 inches in the manifold. This change in pressure causes air to rush through the carburetor barrel. Fuel is metered into the air stream and the velocity breaks it up into very fine particles. Of course, this is only a simple explanation of the operation of carburetors of the type installed on nearly all late-model cars. What actually happens in normal carburetion is more clearly shown in sectional views in Figs. 4 to 7 inclusive, also in Fig. 10. While the sectional views are only representative, it will be noted that there are five systems built into each carburetor. Only the accelerating system is operated mechanically by means of the throttle linkage. These systems make it possible for the car-

buretor to supply a fuel-air mixture of varying proportions to meet constant changes in engine speed and load.

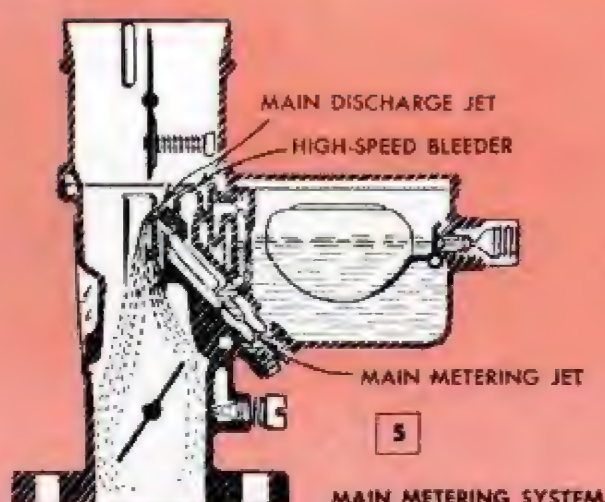
If the engine dies when idling at the stop light or curb, a common cause is an air leak at the carburetor flange, Fig. 3, or at the intake manifold. Often tightening the screws at the carburetor flange will stop a slight leak at this point. However, if there is reason to believe that an air leak either at the carburetor flange or manifold is causing trouble, it is better to install new gaskets. If this is done, be sure that the gaskets used are the type specified for the purpose. Just any gasket material won't do at these critical points. For example, a thicker gasket under the carburetor flange may raise the unit sufficiently to make readjustment of the throttle linkage necessary. A manifold gasket not designed for high temperatures may blow out in a short time.

The carburetor-float system, Fig. 10, is designed to maintain a constant supply of fuel at a level which varies only slightly throughout the entire speed range of the engine. Manufacturers of carburetors supply detailed instructions for setting the float level and, whenever resetting of the float is necessary, these should be followed carefully. Tiny, gritty particles may build up in the gummy deposit which forms as a residue of the slow evaporation of gasoline, and in time, alter the shape of the needle-valve seat, Fig. 10. In some cases, this accumulation may cause the valve to stick. Periodic cleaning of the carburetor will prevent gum deposits from interfering with proper operation. This can be done as in Fig. 8, without removing the unit or dismantling any part. It is only necessary to remove the air cleaner. However, this simple cleaning process consists of several steps, or stages, and in order to do a thorough job it is necessary to have clearly in mind the operation of the carburetor systems.

Representative carburetor cross sections below show the engine with idling and moderate-speed fuel-air first two systems operating automatically to supply mixtures. Note that idling mixture enters below throttle



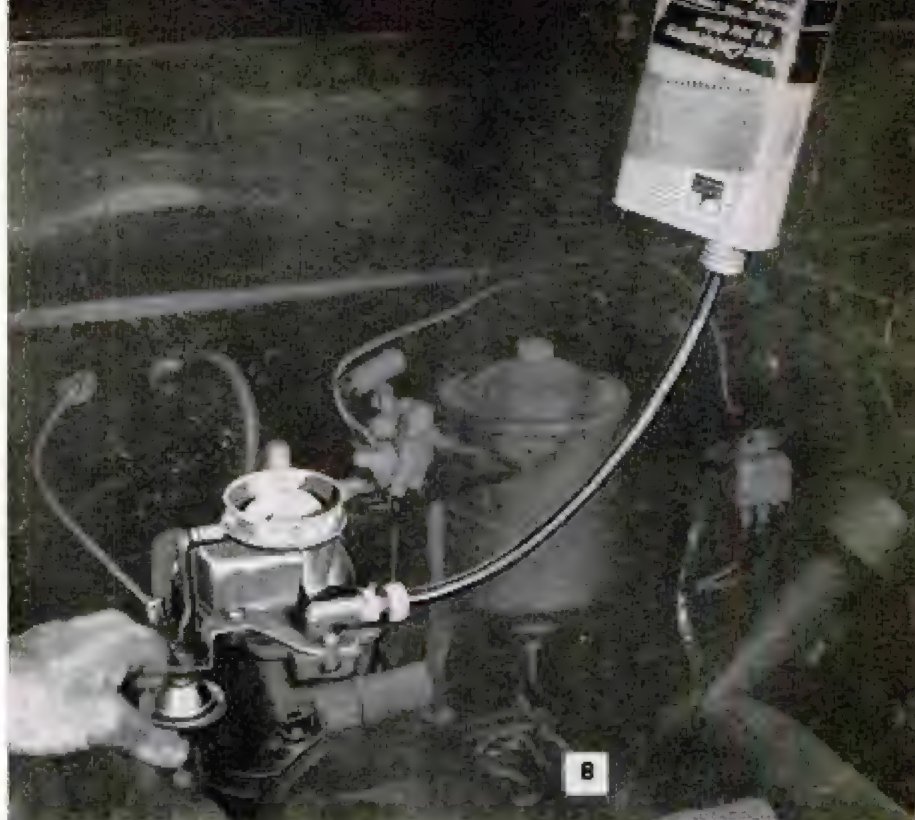
4 IDLE SYSTEM (2nd STAGE)



5 MAIN METERING SYSTEM

Taking these in order and beginning with the idle system, Fig. 4, movement of air through the carburetor barrel is reduced to the minimum during idling periods. Fuel is discharged at a point below the closed throttle. As the throttle is opened on acceleration, fuel flows into the air stream through the main metering system as in Fig. 5. This system controls fuel flow during the intermediate, or part-throttle position. Air enters through the high-speed bleeder as the throttle is opened. This air stream passes directly into the main discharge jet. At the same time it is necessary that the mixture be further enriched and a vacuum piston automatically operates a power by-pass jet to provide more fuel. For sudden, hard acceleration it is necessary for the carburetor to supply momentarily an extra quantity of fuel in excess of that normally required and this is accomplished by the accelerating pump. In most carburetor systems this unit is throttle-operated and its closing is timed by a duration spring, Fig. 6, which operates to continue the extra flow of fuel until the engine reaches the desired speed. At this point, the compression of fuel in the pump cylinder has decreased sufficiently to permit the spring to return the piston to its seat. At fast cruising speeds, the carburetor power system, Fig. 7, is in operation when the throttle is steady and very nearly wide open. The parts also gradually assume this position when the engine is heavily loaded, as on a steep hill.

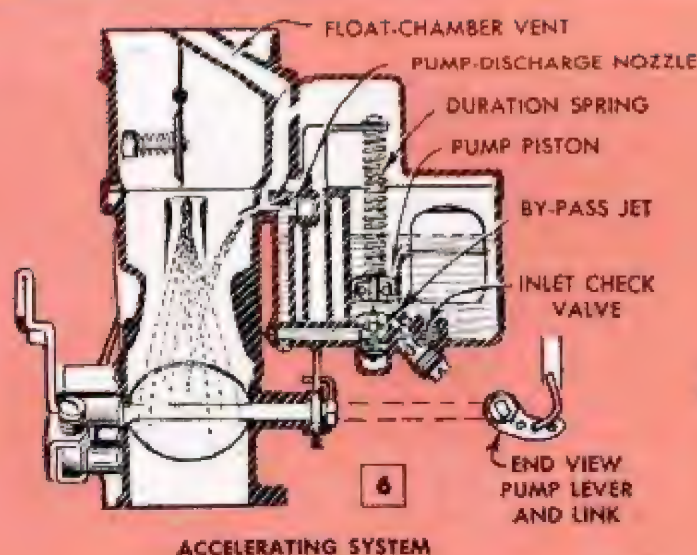
Paper-thin gum deposits and foreign objects as fine as a human hair, Fig. 10, can so greatly restrict the flow of fuel through



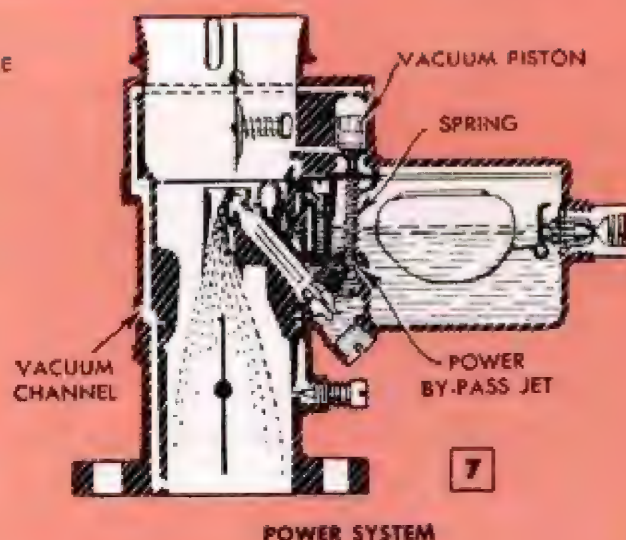
Special solvents make it possible to thoroughly clean carburetors that are in good condition without removing or dismantling any part of the unit. Connect solvent container as shown

certain passages in the carburetor as to upset its entire cycle of operation. Periodic cleaning with a special solvent is a reasonably sure cure for carburetor troubles until movable parts become so worn that replacement is necessary. To clean the carburetor without removing or dismantling, warm the engine to operating temperature and connect the container of solvent as in Fig. 8. Then, with the air cleaner removed, start the engine and allow it to idle. At idling speed solvent enters the float system, cleaning the needle valve and seat and the idling jets. Then open the throttle until the engine is running at a speed equivalent to a road speed of about 40 m.p.h. This brings

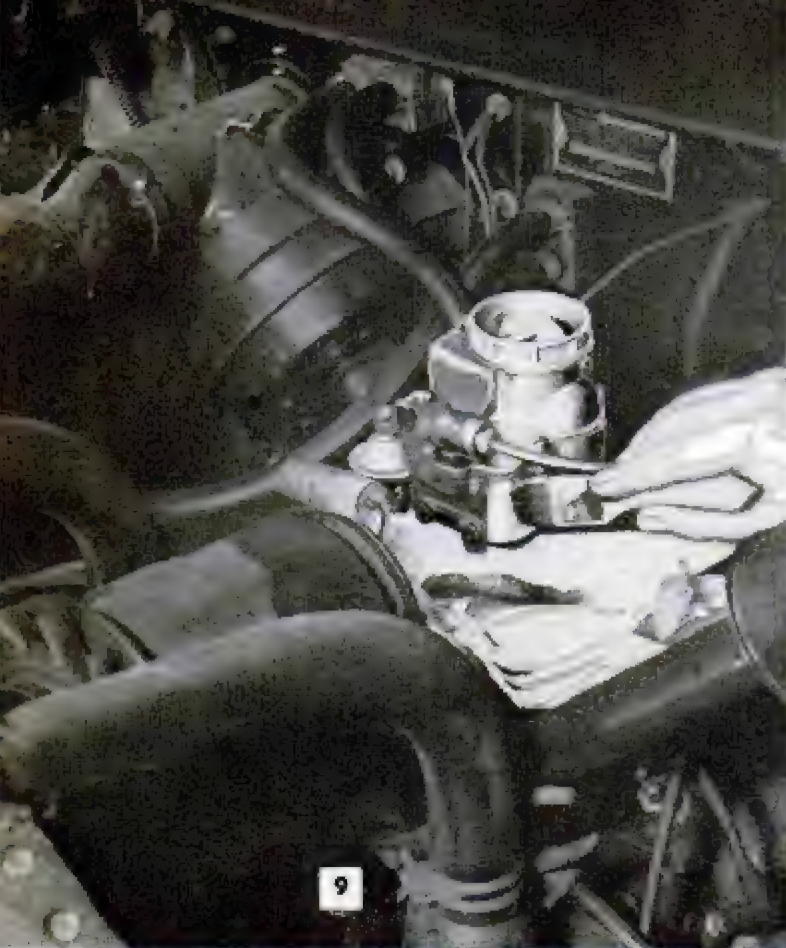
Accelerating system of carburetor operates when you need a quick surge of power for passing a car or truck on the highway. Power system supplies extra fuel required for high cruising speeds and for hill climbing



ACCELERATING SYSTEM

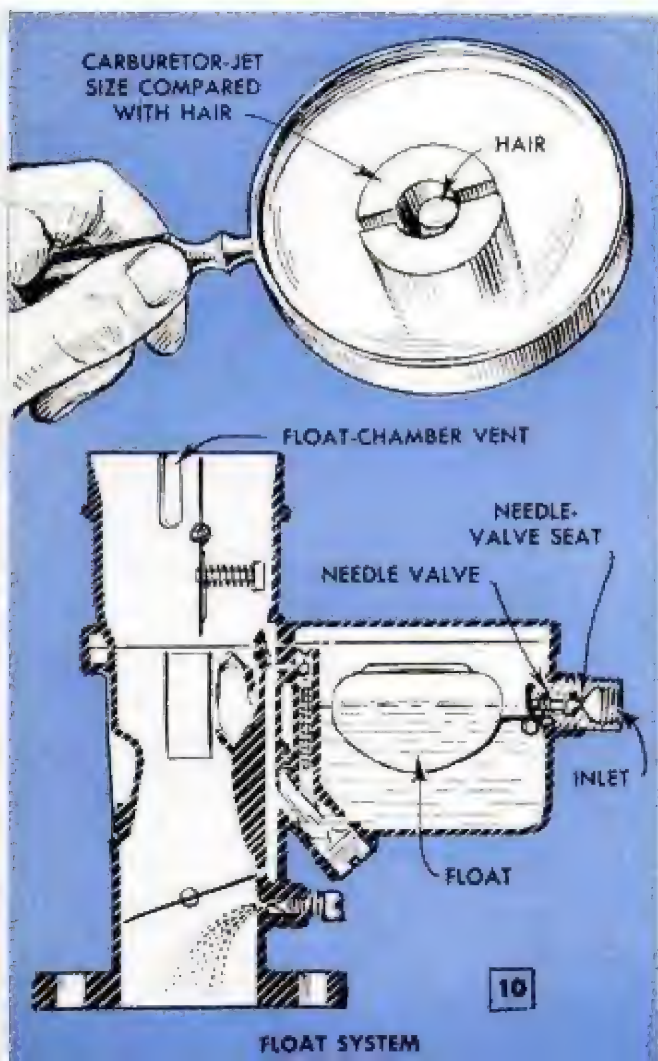


POWER SYSTEM



After cleaning small passages in the carburetor, clean the exterior, applying the solvent with a small brush. While you're at it, it's a good idea to clean throttle linkage, removing any mud, tar or other material that interferes with easy operation

the main metering system into operation with solvent and fuel flowing from the main discharge jet, the high-speed bleeder and the main metering jet. Now, while holding the throttle steady, place the palm of the hand over the air inlet momentarily. The high vacuum resulting from this sudden, momentary stoppage will force a quantity of fuel and solvent into the air horn, cleaning it thoroughly. Allow the engine speed to return to idle, then suddenly pull the throttle wide open to bring the accelerating system into operation. Release the throttle before the engine reaches top speed. This forces solvent through the accelerating system. Finally, open the throttle more slowly to the wide-open position to bring the carburetor power system into operation. Hold the engine at top speed for only a moment, then release the throttle. Now readjust the idle needle valve until the engine idles smoothly without any tendency to rock in its mountings. Wash the air cleaner thoroughly and renew the oil supply if the cleaner is of the oil-bath type. Then clean the outside of the carburetor as in Fig. 9, using the same solvent as was used to clean it internally. It's a good idea to clean the throttle linkage, removing any mud, tar or other material that might interfere with free movement of the parts. It should be kept in mind, of course, that the engine must be in good condition before maximum performance can be expected from the carburetor. Burned valves, worn rings and any other defective parts must be replaced before the engine will respond to carburetor servicing and adjustment. ★ ★ ★



Weather Stripping Acts as Bumper On Backs of Chairs

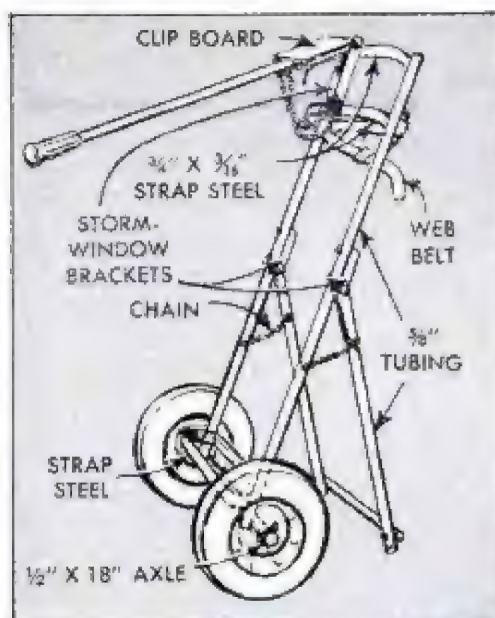
Foam-rubber weather stripping, carefully applied to the backs of chairs with rubber cement, acts as a neat and effective bumper to prevent marring of walls. The same treatment can be given to the back edges of tables and desks located near walls.

R. F. Donovan, Guttenberg, N. J.



Golfer's "Caddy" Takes Work Out of the Game

For the golfer who wants more enjoyment and less work in his game, here's a lightweight "caddy" to carry his clubs. To construct it, cut two 30-in. lengths of thin-wall conduit for the main frame, and two 20-in. lengths for the supporting brace. An 11-in. length of the tubing is bolted across the bottom of the brace. Three 10-in. strap-steel cross braces are bent as shown in the illustration and bolted to the main frame, two near the top and one near the bottom. The axle then is fastened to the bottom of the main frame with bolts, and the supporting brace is attached by means of two storm-window brackets. Short lengths of chain hold the supporting brace at the proper angle when it is extended. Two web-type belts are used to hold the bag on



the cart. The handle, also thin-wall conduit, is attached with a storm-window bracket. As a finishing touch, a small clipboard is bolted to the handle to hold the score card handy for marking.

Splashless "Propeller" Mixer Raises Pigment in Paint Can



This paint mixer will not dig into the bottom or sides of the paint can and it won't splash or throw the paint, yet it will raise the pigment from the bottom of the can and do the complete job of mixing in a short time. The mixer consists of a "propeller" blade which is shaped from an $\frac{1}{8}$ x $\frac{1}{2}$ -in. iron bar by grinding one side of the bar to form opposite bevels. The underside of the bar is left flat. The propeller is riveted or soldered to a $\frac{1}{4}$ -in. steel rod, which can be chucked in an electric or hand drill. The tips of the mixer blade are filed round to prevent damage to the paint can.

Wire Loop Checks Diameter of Hole Dug For Septic Tank

When digging a hole for a septic tank, the diameter of the hole should be checked all the way down to avoid having the tank bind against the sides when lowered. One method of making sure the diameter is large enough and still eliminate unnecessary digging is to wrap a length of stiff wire around the tank, twisting the ends of the wire together to form a loop. Then slip the loop off the tank and, holding it horizontally, lower it down the full depth of the hole. Any portions of the hole which lack clearance will be seen immediately. If you don't have the wire on hand, a similar gauge can be made by nailing together two strips of

wood at right angles to each other. The lengths of the strips should be slightly greater than the diameter of the tank. They should be rotated as they are lowered to check clearance at all points.

Jay Worthington, Weston, Vt.

B-r-r-r-r . . .

You won't be cold, but you can be comfortably cool on the hottest day or night if your home is air conditioned. Read the story next month on air conditioning and see how cheaply it can be done



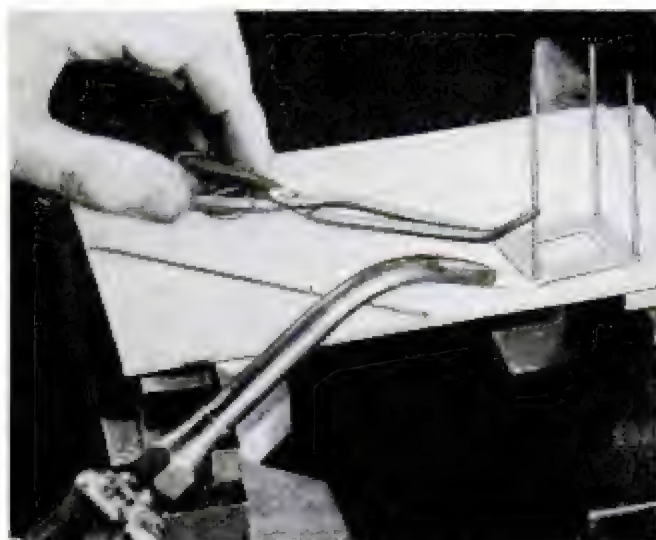
Identify Home Movies With a "Film Brander"

By Walter E. Burton

THIS "FILM BRANDER" originally was designed to imprint the owner's name and address at the beginning of home-movie films, but in actual use has turned out to be much more versatile. It titles, imprints dates, identifies scenes and can be used as a magnifier when inspecting film frames. The information to be recorded is printed on a piece of matte-surface film, onionskin paper or other translucent or transparent support. This title card is clipped in the film brander, which is slipped over the camera lens like a cap or filter. The camera is pointed toward a source of light and a few frames of film exposed. It's that simple. The exploded drawings show the details of two types of the brander, one of cardboard and sheet metal and the other turned from brass on a metal lathe. They are equally effective. To bring the title card into focus, a copy lens is required. This is a magnifying lens of about 50-mm. focal length and 20-mm. diameter. The size of the opening in the



Size of the frame opening is determined by the focal length of the lens used. The edges of the frame are filed to remove burrs after cutting out center



Wires are silver-soldered to frame by acetylene torch. Solder and soldering iron do job as well

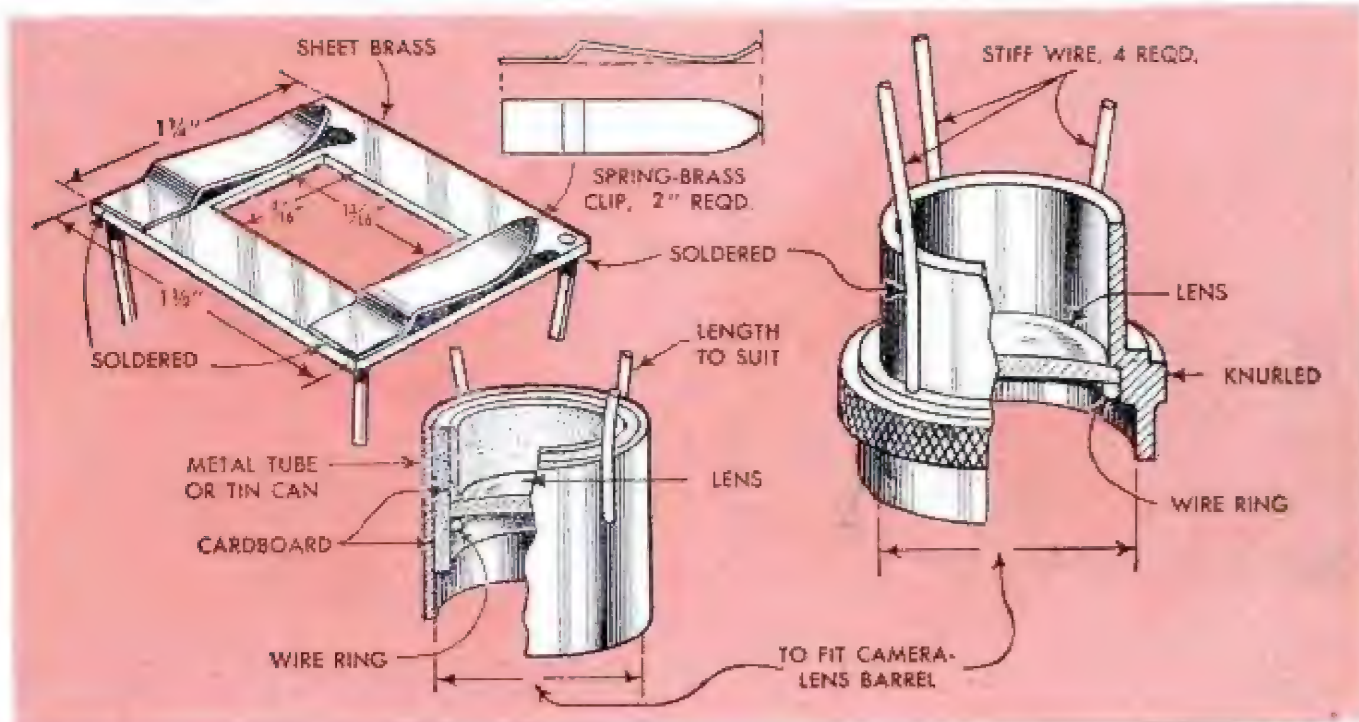


Diameter of the recess into which auxiliary lens is fitted is slightly larger than diameter of lens

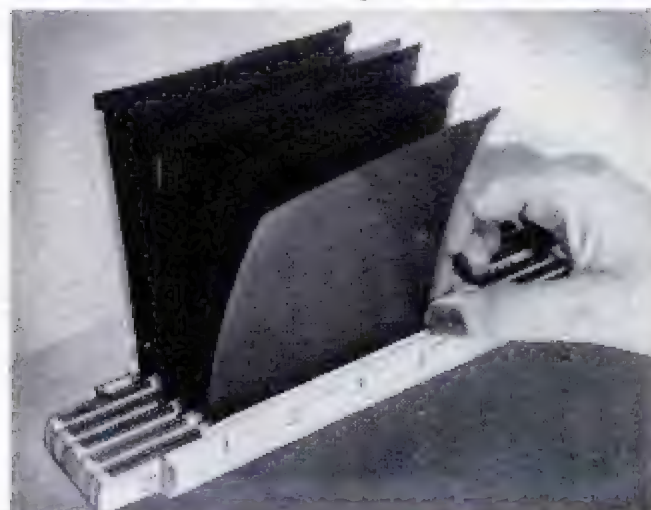
frame is determined by the focal length of this lens. Movie-titling tables give the area covered by copy lenses of various focal lengths. For a 50-mm. lens, a $\frac{9}{16} \times \frac{13}{16}$ -in. opening fills both 8-mm. and 16-mm. film frames in the average camera. The length of the wires which hold the frame in front of the lens is determined by pointing the brander at a distant object before the wires are soldered to the lens holder. An image will be projected on a blank title card and the distance between the frame and the lens is adjusted until this image is brought into sharp focus. The wires are then soldered. A few trials with the film brander will enable you to determine the best exposure time. Satisfactory results can be obtained if the lettering is done in India ink on a matte cellulose film. A shutter speed of $\frac{1}{30}$ sec. is used at a lens opening of f:8, and the camera is held a few inches from a No. 2 photo-flood lamp covered with a silk diffusing screen. ★ ★ ★



When title card is inserted beneath clips, lettering is positioned so it will read correctly when viewed through lens. Title is aligned with camera aperture



Cut-Film Holder Improvised From Folding Zigzag Rule



When contact printing or making enlargements, a folding rule will provide a convenient holder for cut-film negatives. Inserted separately between sections of the rule as shown, the film not only can be kept in order but also can be protected from scratches caused by contact with each other. Also, as each negative is printed, it may be kept segregated by placing it in the rule slightly to one side of those to be printed.

☞ When too much potassium bromide has been mixed with photo developer, which has a tendency to slow its action, add a little sodium carbonate to the solution to restore it to normal.



Spring-Coil Cord Permits Varied Flash-Gun Lighting Effects

Considerable flexibility in flash-gun lighting is made possible by replacing the original camera-gun cord with one of the spring-coil type. The cord pictured above, which extends up to 7 ft., is a war-surplus type designed for use on tank microphones. This low-resistance, low-tension wire is longer and more flexible than most similar commercial cords and yet returns into a convenient 20-in. coil for gun-on-camera shooting. The cord is attached to the gun by means of a wire spring and to the camera bed with a spring clip or short length of

metal strap. It is necessary, of course, to anchor the cord firmly to both the gun and the camera to prevent pulling the connections loose.—Pfc. Bryan D. Hodgson, Camp San Luis Obispo, Calif.

Lens Acts as Focusing Magnifier

An extra lens will provide an effective magnifier for precise focusing of a reflex camera. First, hold the lens above the ground glass at the distance necessary to produce a clear image and move it closer to make the image appear larger.

Popular Mechanics Bookshop

The Lure of the Outdoors

Now that warm summer days are here, who can resist the zing of a fishing reel or the split-second glimpse of a brook trout leaping for a fly? Whether you are the one-week-end-a-year angler who swears by the old-fashioned earthworm, or the dry-fly purist who sneaks away at the slightest excuse, you'll find a treasury of information in *How to Tempt a Fish*. Here's expert advice from many men: Surf casters from the seacoasts, fly fishermen from the mountains, bait casters from the lake country. All their knowledge and lore is pooled in this book, designed to give any angler a better chance to tempt a finny creature to grab a hook. Order *How to Tempt a Fish* from Popular Mechanics Press, 208 E. Ontario St., Chicago 11. The price is \$2.00.

The Sportsman . . .

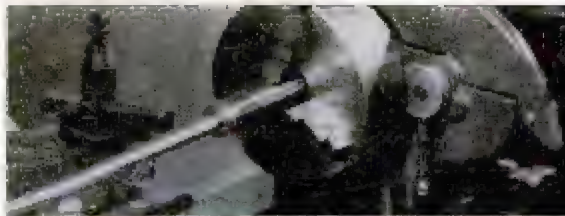
. . . will find a companion volume to *How to Tempt a Fish* on the Bookshop shelf this month. It's Joe Godfrey's *Guide to Good Hunting and Trapping*. Godfrey, one of the country's best-known sportsmen, has collected here all the tips and hints learned in

a lifetime of tramping the fields, squatting patiently in duck blinds and following the traplines along the streams. Professional hunters and trappers have added their recommendations. Here are the habits of 46 game animals and 41 game birds, full-page maps of the great flyways, a special section on the hunting dog and tricks of the professional trappers. The price of *Guide to Good Hunting and Trapping* is \$3.00. Order it now from Popular Mechanics Press, 208 E. Ontario St., Chicago 11.

And for Anybody . . .

. . . who likes to get outside a stuffy house during the summer months, we offer *How to Build and Enjoy Your Own Outdoor Kitchen*. Here are complete instructions on outdoor cooking, from placing the first brick or concrete block for the fireplace to preparing the barbecue sauce for the first meal. You'll find plans and details on a variety of fireplaces, ovens, pits and complete kitchens, along with recipes for a good many tangy and unusual dishes. Order from Popular Mechanics Press, 208 E. Ontario, Chicago 11. The price is only \$2.00.

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SHOP NOTES

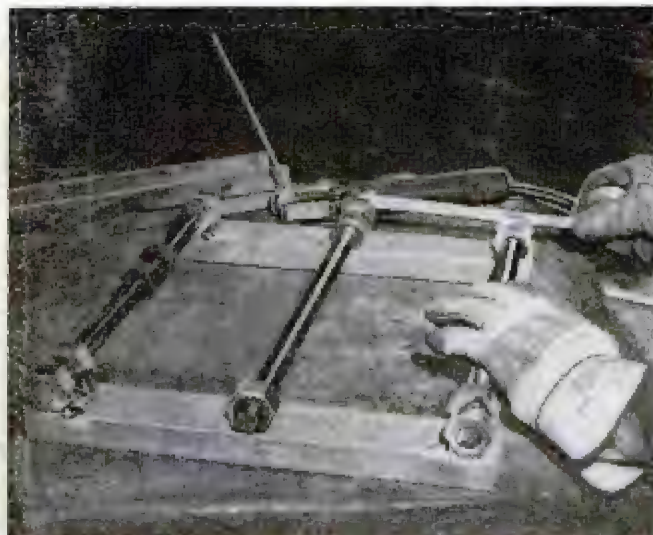
ARBOR PRESS for small shop

By Evan Wright

SHOPS HAVING only occasional use for a bench-type arbor press can make this unit in a few hours' time and at a very small outlay for materials. It's suitable for replacing bushings and for a variety of assembly and bending operations. The original was made by cutting 1 x 2-in. steel channel into 14-in. lengths, using two lengths for the pressure beam, two for the bridge and four for the base. The uprights supporting these parts are two 16-in. lengths of $\frac{3}{4}$ -in. threaded rod, each being fitted with six hex nuts. In the assembly of the frame, four of the nuts on each rod are welded to the two members of the pressure beam and to the two channels forming the cross member of the H-shaped base. The nuts serve as spacers between the two channels that form each of these members as in the details on the following page and also in the photos below.

The press screw also is a 16-in. length of $\frac{3}{4}$ -in. threaded rod fitted with three hex nuts, two of which are centered between the members of the pressure beam when the parts are assembled. Care must be taken to locate the nuts so that the press screw stands exactly at 90 deg. with the top of the bridge, and to "synchronize" the threads so

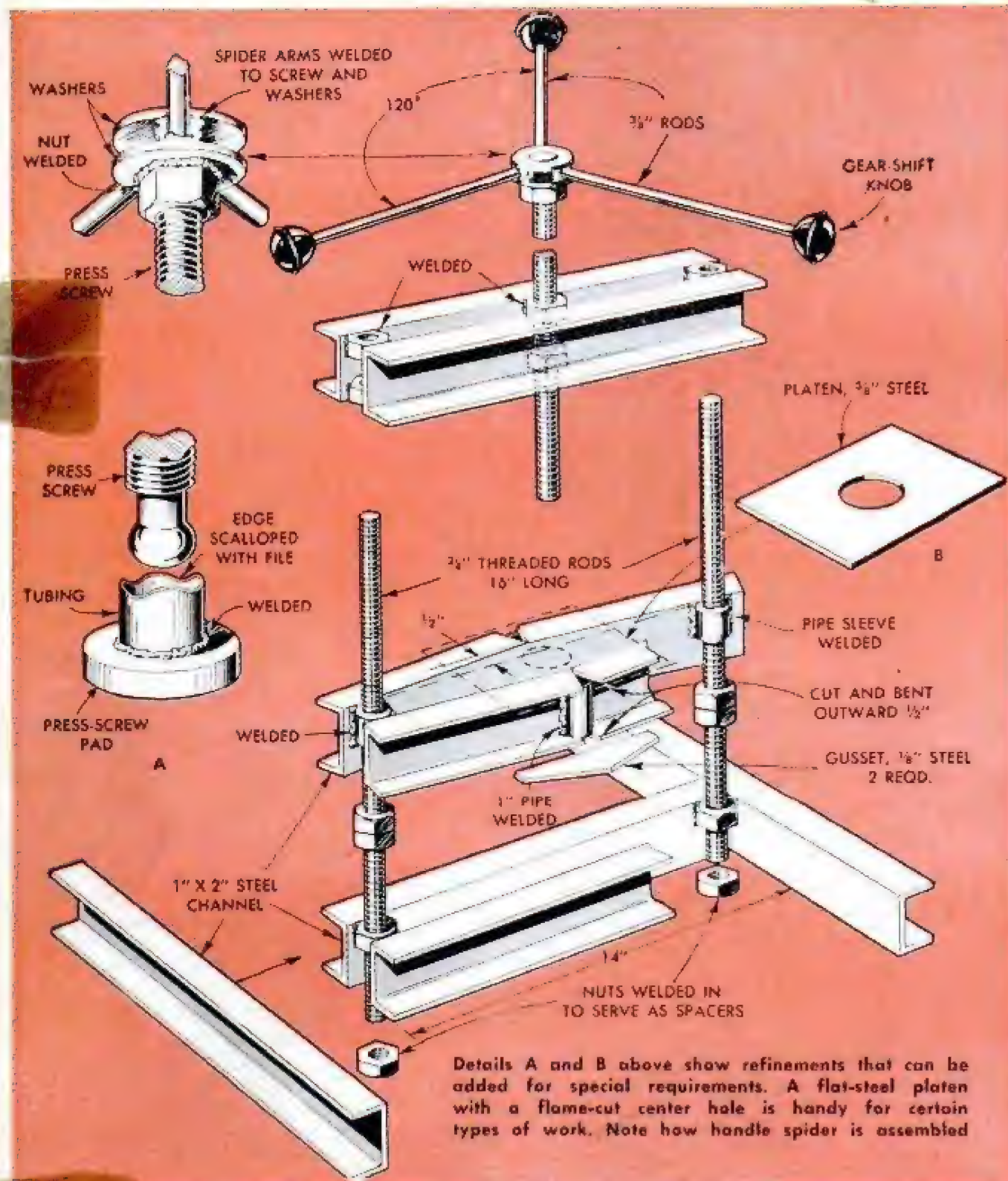
Start assembly by placing parts on welding bench and squaring position. Note location of the press screw



the screw will turn in either direction without binding. This is done as in the left-hand photo below, which shows the first step in assembling. The parts are placed on the welding table as shown, two nuts being run down to the center of each rod. One pipe sleeve is placed on each rod to be welded later to the member forming the bridge. Then a pair of hex nuts is run onto the ends of each rod and spaced about $1\frac{1}{2}$ in. apart center to center. Square the parts, check spacing and then tack-weld the pairs of nuts

When tack-welding uprights to top and bottom members, wrap with asbestos to protect from splatter

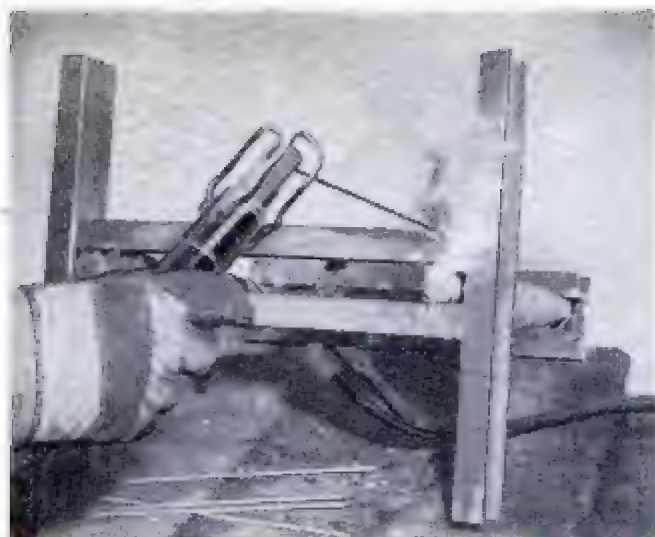




at the ends of each rod to the channels. Now run three nuts onto the press screw, a pair near the top end and one pair near the lower end. The latter serves to hold the screw in line until the two at the top have been welded in place. When welding the nuts at the top of the rod to the channel, weld only one at a time, permitting the work to cool before welding the second in place.

Next, the two remaining channels are tack-welded to the nuts already attached to the members of the pressure bar and base. Now wrap the rods with asbestos as in the lower right-hand photo on the preceding page to protect the threads from spatter,

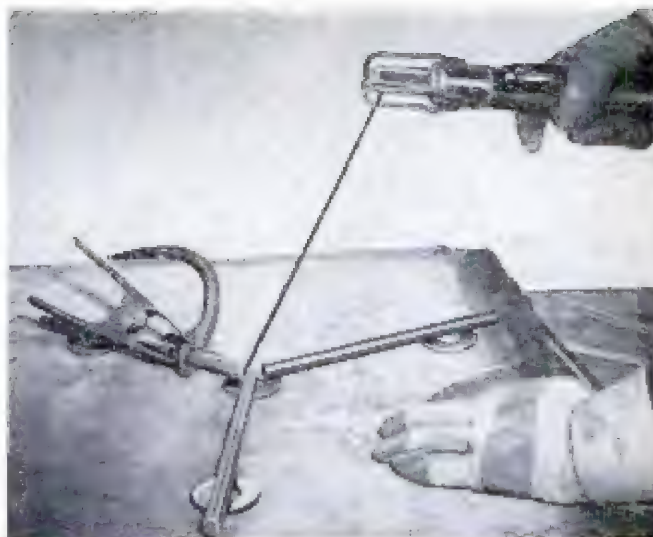
then finish-weld the parts as in the left-hand photo, page 191. Note in the detail above, that the webs of the two lengths of channel forming the bridge are cut at the center, and that each member is bent outward 1/2 in. This must be done before welding the channels to the pipe sleeves. After bending and welding the two channel members to the pipe sleeves to form the bridge, gusset plates of 1/8-in. steel are welded to the lower webs over the opened saw cuts. The detail above shows a 1-in. pipe stiffener welded between the webs of each member where cut. If desired, the stiffener can be omitted and a second gusset plate welded to the un-



After tack-welding to hold parts in place, weld base members at right angles to make rigid assembly

derside of the upper web on each member.

Some types of arbor-press work will require a pad mounted in a ball and socket as in detail A on the opposite page, also a platen with a center hole as in detail B. These refinements can be made up to suit individual requirements. However, it should be kept in mind that installation of



Handle spider is built up by first welding rods to a heavy washer. The rods are located 120 deg. apart

a pad limits the use of the press for such work as replacing bushings. The upper details on the opposite page and the right-hand photo above show how the handle spider is built up from a hex nut, three $\frac{3}{8}$ -in. steel rods, washers and gearshift knobs. For adequate leverage the rods should be about 8 in. long. ★ ★ ★

Discarded Tank Provides Automatic Calf and Poultry Waterer



Mounted on a concrete slab and fitted with a regulator valve, an unused hot-water tank forms an inexpensive automatic waterer for calves and poultry. A 2-ft. section is cut from one end of the tank and half of one side of this section is removed for a distance of 8 in. back from the open end. The endpiece is cut from the unused portion of the water tank and a part of the endpiece welded across the end of the waterer to form a trough. Depth of the water, which is piped from the farm water supply, is controlled by an ordinary float-type regulator valve housed in the covered portion of the waterer. The valve float can be pro-

tected by hinging a metal flap to the top of the waterer so that it covers the open end of the valve housing. To make the flap, simply weld a hinge to the leftover section of the water-tank endpiece. The waterer is held stationary by welding it to an angle-steel frame which has been bolted to the concrete platform.

Hole Drilled in Heater Tube Simplifies Bleeding Air

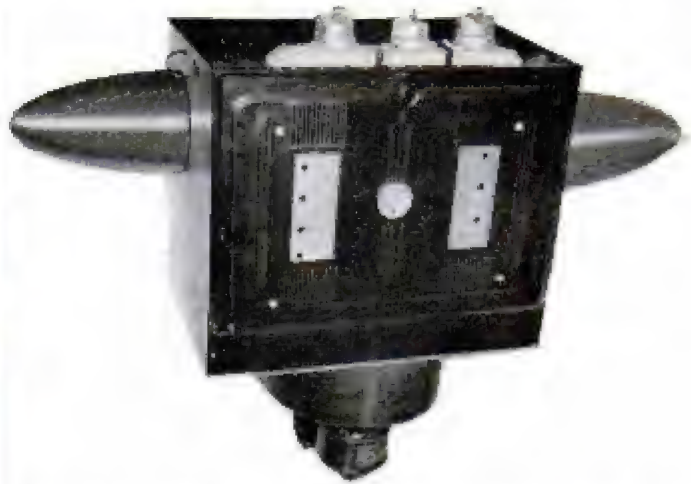
An air-bound automobile heater gives off a reduced amount of heat and must be bled before its efficiency is restored. To simplify the bleeding operation, pull the upper heater hose forward until it is within $\frac{1}{4}$ in. of coming off of the metal connecting tube. Then drill a $\frac{1}{8}$ -in. air bleed hole in the metal tube. Leave the hole exposed until the air is bled out and liquid appears, then slide the hose back over it. This will eliminate the necessity of removing the hose and later refilling the water system, and yet do an effective job of bleeding.

❏ Farm-made lard, which tends to become rancid during summer months unless placed in cold storage, can be kept fresh and edible by mixing a commercial vegetable shortening with it as it is being made. One pound of shortening is sufficient to treat 20 to 25 lb. of lard.

Dutch-Oven Spray Booth Also Doubles as Drier



Designed by L. V. Grover, of Los Angeles, Calif., this combination spray booth and drying oven is ideal for the home craftsman. Its construction is centered around an inexpensive sheet-metal cooking oven of the type used on top of a stove. A



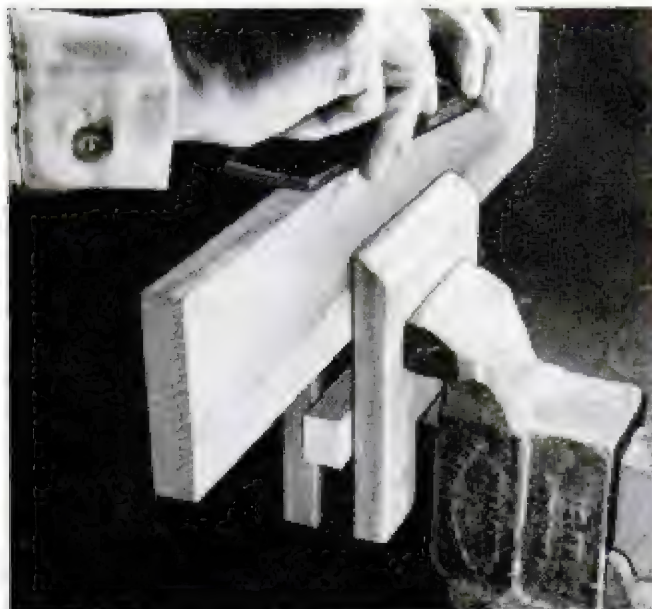
hole is cut in the bottom of the oven for an exhaust fan which carries off the paint fumes through an outside duct. Holes also are cut in the ends of the oven for heat lamps of the spotlight type which are attached to the outside so that the booth also serves as a drying oven. When used as such, the fan is turned off. A wooden turntable may be installed on the floor of the oven to facilitate spraying small pieces. *Caution:* Avoid using a paint booth in a basement where escaping lacquer fumes might be ignited by the pilot light of a water heater or other open flame.

Pot Menders Used to Plug Holes in Small Metal Boat

Small holes in a metal boat can be repaired by plugging them with menders of the type used for repairing leaky pans, buckets and metal kitchenware. Of the two types most frequently used, the rivet-type stopper generally is best for small holes. The rivet is inserted through a washer placed on one side of the hole and

peened over a second washer on the opposite side. More suitable for plugging large holes, the screw-type mender is threaded through two large washers placed on opposite sides of the hole and then tightened. It's a good idea to carry a package of the menders on a fishing trip in case emergency repairs are required.

Wooden Spacer Improves Grip of Auxiliary Jaws on Vise



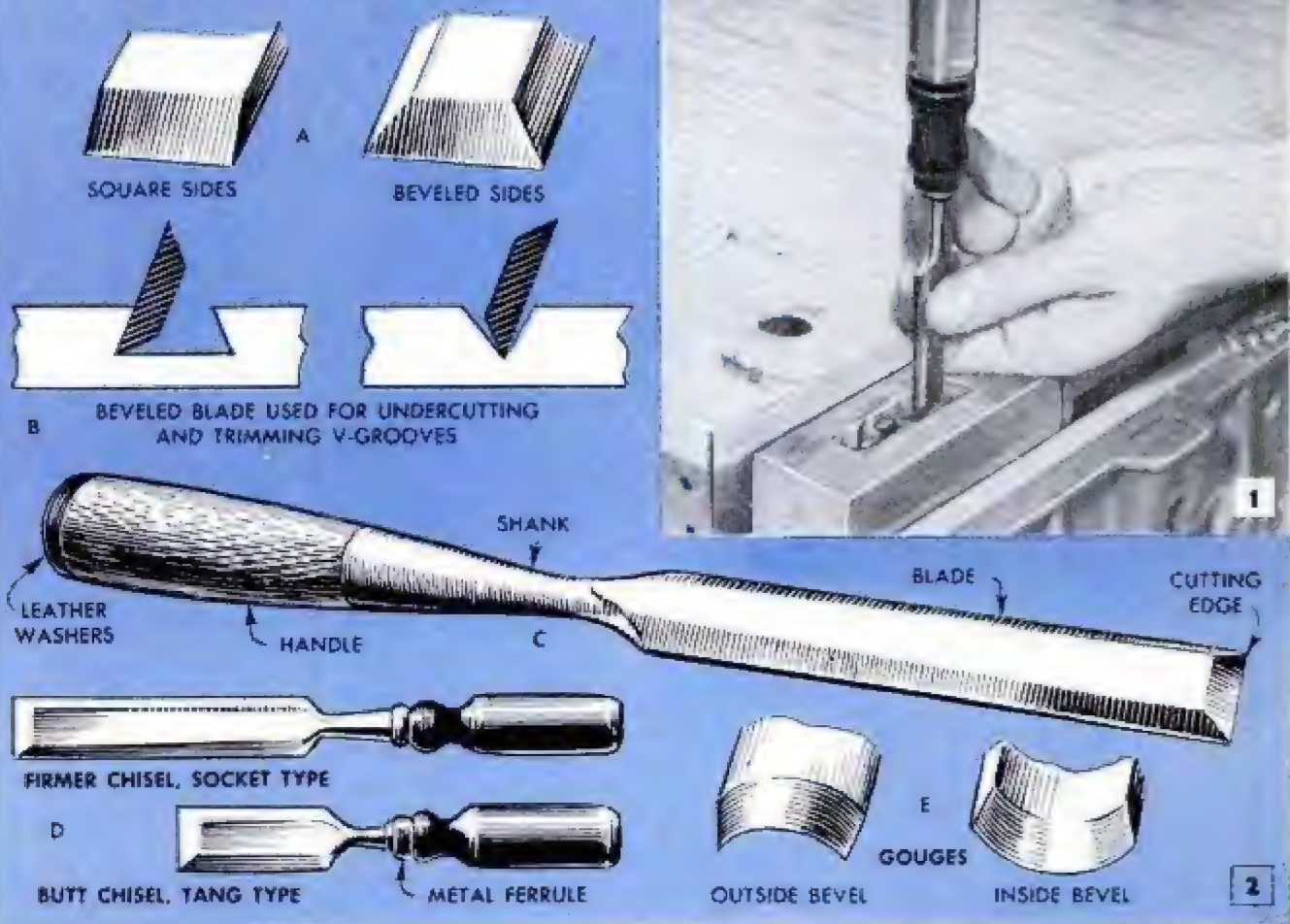
When using wooden auxiliary jaws to protect work held in a machinist's vise, cut a block of wood to the same thickness as the work and insert as shown to allow the jaws to grip the work evenly at all points. Kept on hand in your workshop, a set of blocks of various thicknesses will prove a timesaver in the long run.

Clinton R. Hull, Costa Mesa, Calif.

Cleaning Solution for Painted Walls

To remove dirt and smudges from a painted wall, apply a solution consisting of borax, 2 oz., and ammonia, 1 teaspoon, mixed in water, 2 qt. This will provide enough for use with two buckets of water, which should be sufficient for ordinary jobs.—Ted Otsu, Vancouver, B. C., Can.

How to cut with WOOD CHISELS and GOUGES



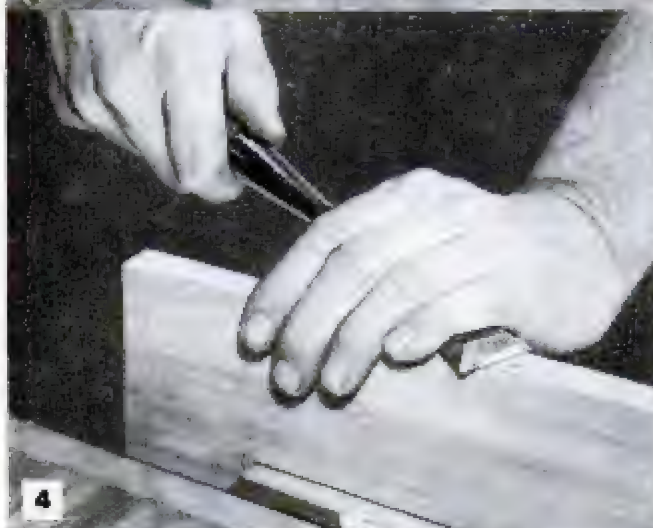
By E. R. Haan

LIKE ANY KEEN-EDGE woodcutting tool, your wood chisels are designed to be used in a specific manner. Knowing how to handle them correctly not only will produce better work with less effort but will put you in the class of the expert.

Kinds of chisels: There are three popular types of wood chisels, namely, butt, firmer and gouge. Although chisels are available from $\frac{1}{8}$ to 2 in. wide, the four sizes that meet most homeowners' requirements are $\frac{1}{4}$, $\frac{1}{2}$, $\frac{3}{4}$ and 1-in. widths. The cutting edge of a chisel is straight across the end of the blade, at right angles to its axis, and for easy and accurate cutting must be kept razor sharp. The cutting edge is beveled on one side only. The sides of the blade may be flat, or the top sides may be beveled as in Fig. 2-A. The latter type is the lightest and is especially adapted for undercutting and for getting into V-shaped grooves hav-

ing an angle of less than 90 deg., detail B. The nomenclature of chisel parts is given in detail C. Detail D shows the difference between a firmer chisel, with a blade about 6 in. long, and a butt chisel, which has a $2\frac{1}{2}$ to $3\frac{1}{2}$ -in. blade. The former has the longer reach but the latter is handier for close-up work. Short, thin-bladed chisels for delicate cutting are called paring chisels. Glazier's chisels have short, wide and heavy blades of special use in window work. Gouges have curved cutting edges of various radii for rounding edges, bottoms of grooves and for cutting flutes and beads. They are ground with the bevel either on the outside or the inside as in detail E.

As shown in Fig. 2-C, the handle of a chisel or gouge generally slips into the end of a hollow, tapered shank, which is a continuation of the blade. Some types have a

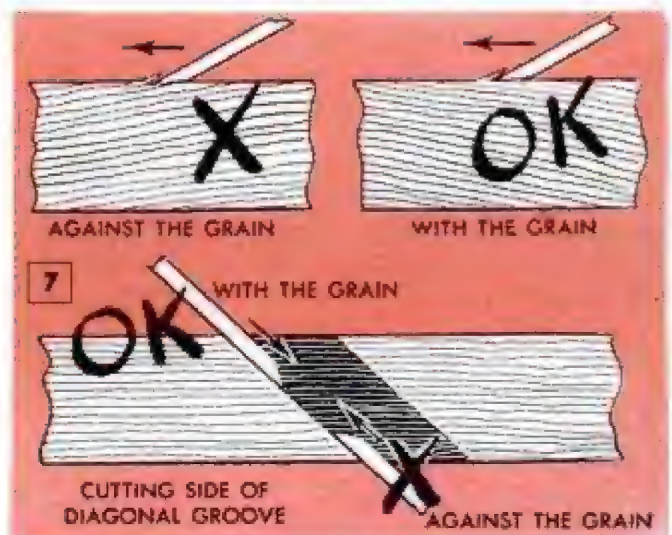


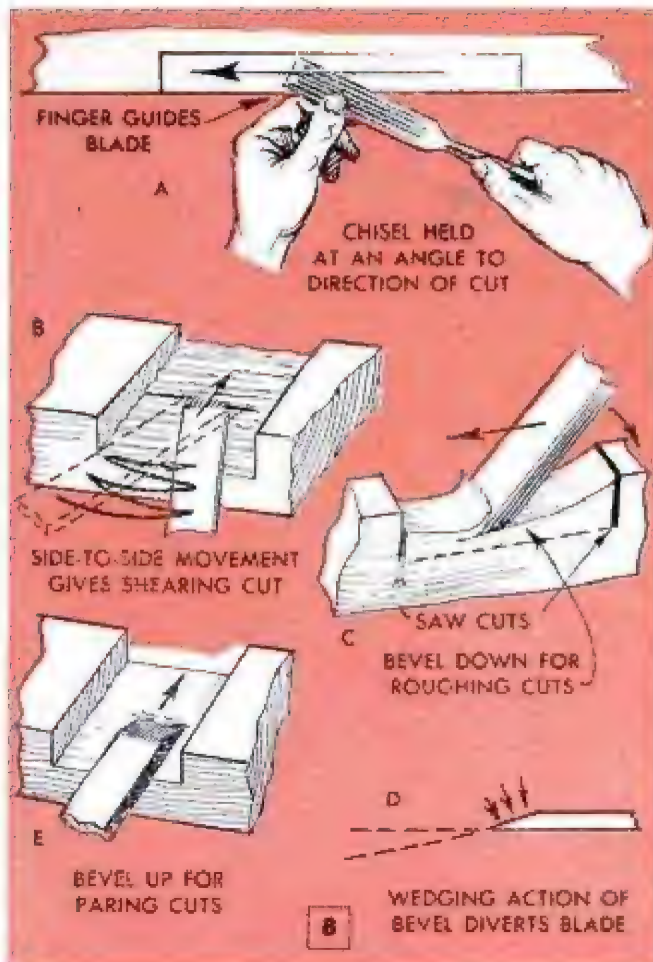
tang on the blade that slips into a handle, the end of which is reinforced with a ferrule. Handles may be hardwood or plastic and are replaceable. Most wooden handles are capped with leather washers.

Holding a chisel: For light cuts and delicate work you employ both hands in using a chisel. Figs. 3 to 6 inclusive show various ways of holding a chisel properly for different kinds of work. One hand guides the blade while the other does the pushing. For rough cutting, particularly across grain, you use a mallet to drive a chisel as in Fig. 1. Light taps permit better cutting control than heavy ones. Using an ordinary hammer instead of a mallet will soon "mushroom" a chisel handle and may even split it unless the blows are cushioned by a rubber crutch tip slipped on the hammer head. When using chisels, always follow safety precautions, directing the sharp edge away from you and keeping both hands behind the cutting edge.

Pointers on cutting: Work to be cut with a chisel should be rigidly supported. Small work can be held in a vise or by means of a bench hook. When chiseling lengthwise along the edge or surface of wood, always cut with the grain as indicated in Fig. 7. If possible, hold the chisel at an angle toward one side as in Fig. 8-A, which makes cutting easier and keeps the edge sharp longer than when the thrust is straight ahead. Another method of getting these results is to move the chisel from side to side while pushing it ahead as in detail B.

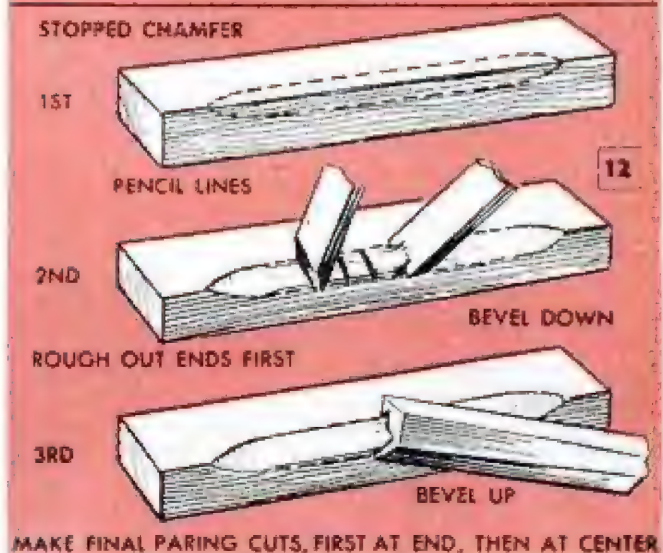
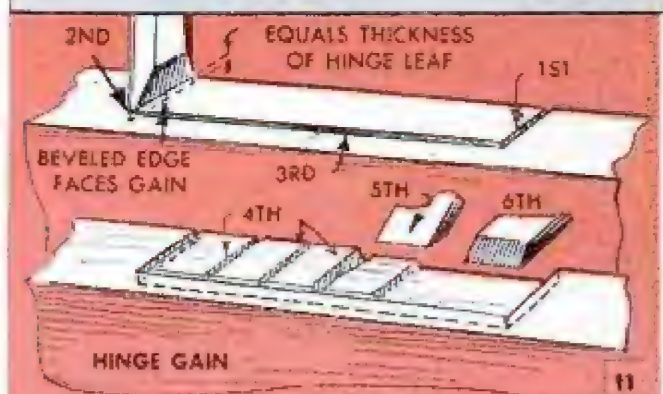
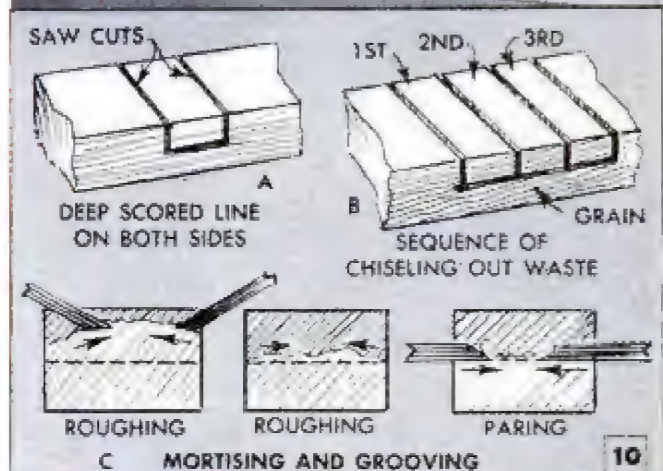
For roughing cuts—the removal of waste wood to within a short distance of the finish line—you hold a chisel with the bevel down, detail C. This gives better control and prevents digging too deeply into the wood. As shown in detail D, the wedging action of wood against the bevel tends to divert the direction of cutting away from a straight line. With the bevel down, a chisel tends to cut progressively shallower, caused by a slight downward pressure on the handle which makes the rear edge of

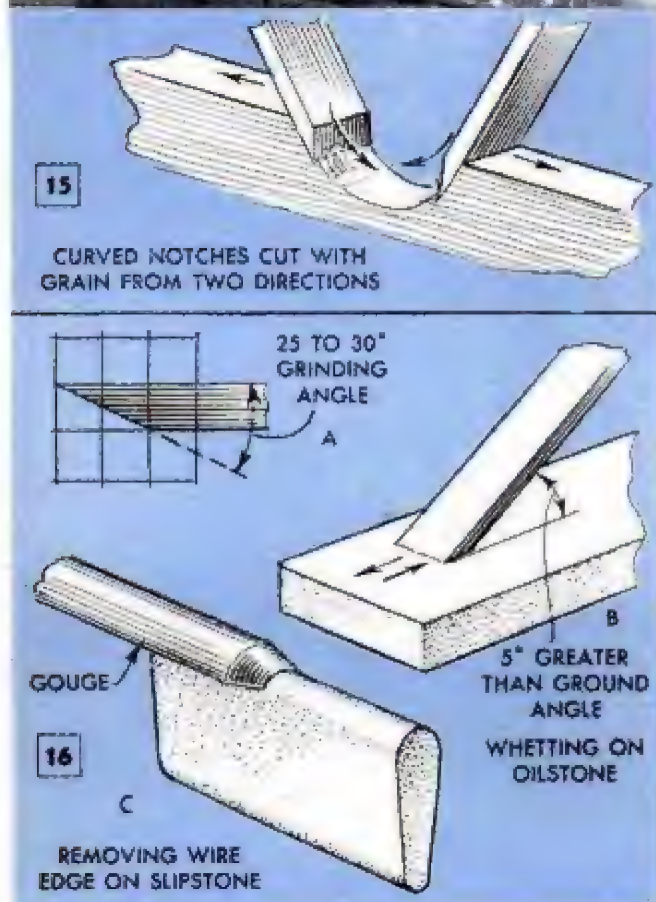
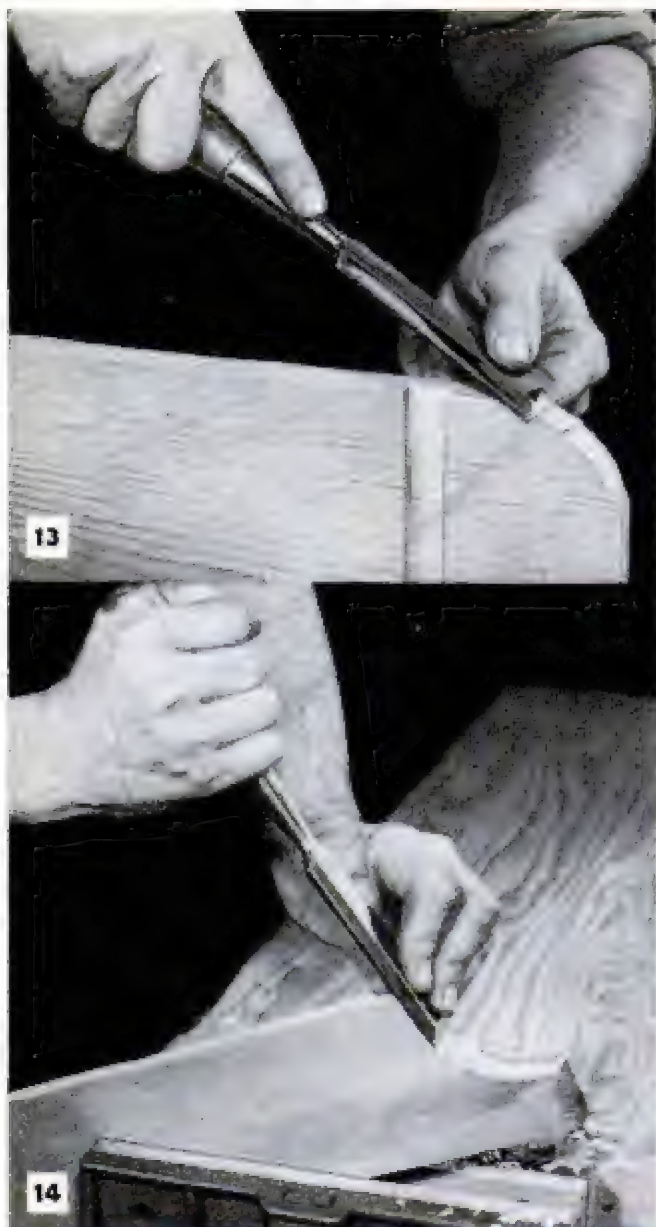




the bevel serve as a lever fulcrum. In roughing cuts, the most common mistake that beginners make is to attempt to remove most of the waste with one or two deep cuts. This usually produces rough edges extending beyond the finish line and often causes the wood to split.

For light finishing, or paring, cuts, you hold a chisel with the bevel up as in Fig. 8-E. Press the flat side of the blade against the surface already finished, which will help to guide the tool in a straight line. Where this cannot be done, as in a long groove, you revert to the bevel-down position so that the handle will clear the work as in Fig. 9. When cutting dados, grooves or rabbets across the grain, Fig. 10-A, it's best to make the outside cuts with a backsaw. Then you chisel out the waste between them from both sides of the stock toward the center, detail C, to prevent splintering at the edges. Wide recesses across the grain should have several saw cuts, detail B, so that the chips will be short and easy to remove, resulting in a uniformly flat surface. The start of the cut should be made along the edge where the chips will split upward toward the surface if the grain runs at a slant. Starting at the wrong edge produces an uneven surface and may cause splitting beyond the depth limit. Sequence of chip removal in wide recesses is given in detail B. Where possible, the work should be set on edge on the bench top and the chisel held vertically





as in Fig. 6, since this position gives better visibility for accurate cutting.

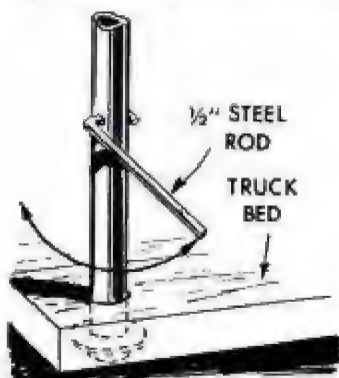
Cutting hinge gains: Shallow recesses, or gains, which accommodate hinge leaves so that they come flush with the wood usually are cut entirely with a chisel. Sides of such a gain can be sawed only when the hinge leaves are as wide as the wooden pieces to which they attach. After marking the outline of the gain with a knife or a carpenter's butt gauge, use a chisel and a mallet to make the shallow end cuts, steps 1 and 2 of Fig. 11. It's best to use a chisel of suitable width so the cuts can be made in one or two passes instead of several successive ones not likely to be perfectly straight. Step 3 is making the long side of the gain. Step 4 consists of making a series of shallow cuts across the grain with chisel and mallet so the chips will be short. Steps 5 and 6 are roughing cuts and a paring cut to exact depth.

Chamfering with a chisel: While a block plane or a spokeshave generally is used to cut plain or continuous chamfers along the edges of stock (a spokeshave also for stopped chamfers), there are occasions when only a chisel can be used, as, for example, to cut short, stopped chamfers on inside edges of panel framing, where another tool cannot be manipulated. Usually a chamfer is cut at a 45-deg. angle. You first mark penciled guide lines on both edges of the stock as indicated by the dotted lines in Fig. 12. Next rough out the ends and then the portion between them. This is done with two or three roughing cuts, with the cutting bevel, and working with the grain. Be especially careful at the end where the chisel will go against the grain when leveling off. A paring cut at the ends first, then the flat portion, finishes the chamfer.

Curved cuts: Convex and concave cuts can be made with a chisel, Figs. 13 and 14. After marking the curve, rough it out with a keyhole or coping saw, grip the work in a vise and, starting at the edge of the wood, work the chisel toward the end. For concave cuts work the chisel downward and outward with a gouging motion. Semicircular cuts are made as in Fig. 15.

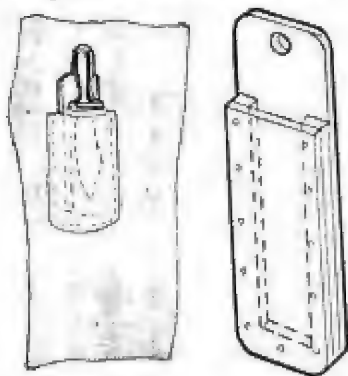
Sharpening: Edges of wood chisels, like plane irons, are ground at a 25 to 30-deg. angle. This results in a bevel that is about twice as wide as the thickness of the blade as shown by the squares in Fig. 16-A. After grinding, you whet the edge, detail B, at an angle of 5 deg. greater than the grinding angle. The flat side of the blade is touched on the stone only to remove burr, or wire edge. On gouges this is done with a slipstone, detail C. While grinding, feed very lightly and keep the edge cool by dipping in water after each pass. ★ ★ ★

Truck-Body Stakes Removed By Built-In Handles



When pipe stakes on a truck bed are held in place by being screwed into floor flanges, they tend to become difficult to remove without the aid of a pipe wrench. However, their removal is made easy by fitting them with built-in steel-rod handles as shown. When swung to a horizontal position, these rods provide the additional leverage required to loosen the pipe stakes.

Wooden Sheath for Sharp Knife Slips Into Overall Rule Pocket



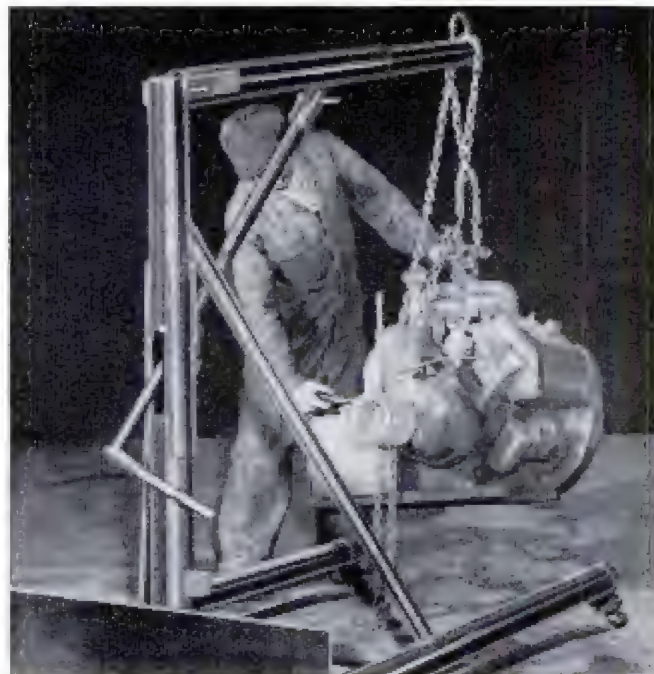
Workmen who frequently use a sharp knife for certain jobs both at the bench and around the shop will find this wooden sheath ideal for carrying the knife safely in an overall-leg pocket. Consisting of three pieces of $\frac{1}{4}$ -in. plywood cut and assembled as shown, the sheath is drilled at the upper end to slip over a convenient nail when used at the bench.

Clipboard Clamp Improvised From Car Breaker Point



Old breaker points are used at one service station to provide clamps on clipboards for holding repair orders and sales slips as well as memos and other forms. This is done by using a large staple for attaching the breaker arm, along with its spring, to a board of suitable size. Mounted as shown, the arm simply is raised in order to slip cards or pieces of paper beneath it.

☛ Vapor lock in an automobile fuel pump frequently can be overcome by soaking a rag in cold water and holding it against the pump.—Walter M. Shutok, Uniontown, Pa.

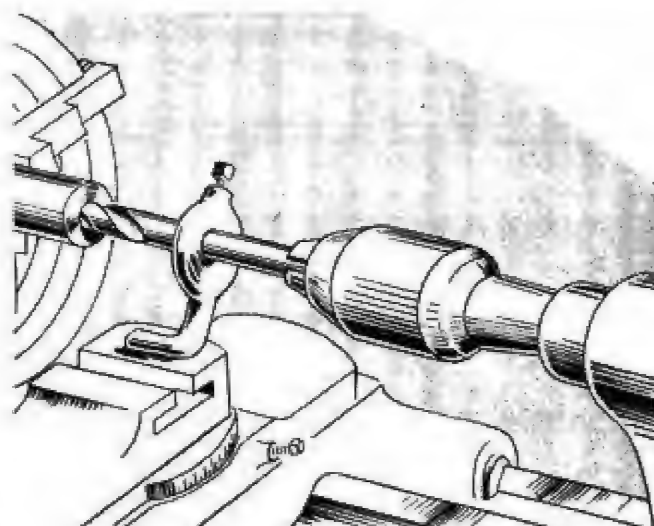


Portable Homemade Crane Lifts Heavy Objects

Needing a portable boom to handle motors and other heavy equipment in his farm shop, one farmer built this crane out of scrap parts. The main frame consists of 6-in. steel pipe and $2\frac{1}{2}$ -in. pipe braces, all welded together. Heavy floor-jack casters are installed to permit the crane to roll, and a U-shaped steel rod is welded to the top of the boom end to form an eye for the chain. The lifting mechanism is a screw jack operated by a ratchet handle from a socket-wrench set.—Ed Mercer, Madison, Wis.

Lathe Dog Mounted on Drill Bit Prevents Turning of Spindle

When using a chuck mounted in the tail-stock of a lathe for drilling, the tapered spindle frequently has a tendency to turn during operation. To prevent this, simply clamp a lathe dog on the twist drill, allowing the end of the dog to bear against the compound rest.



Using Your Lathe for Thread Cutting

By Sam Brown

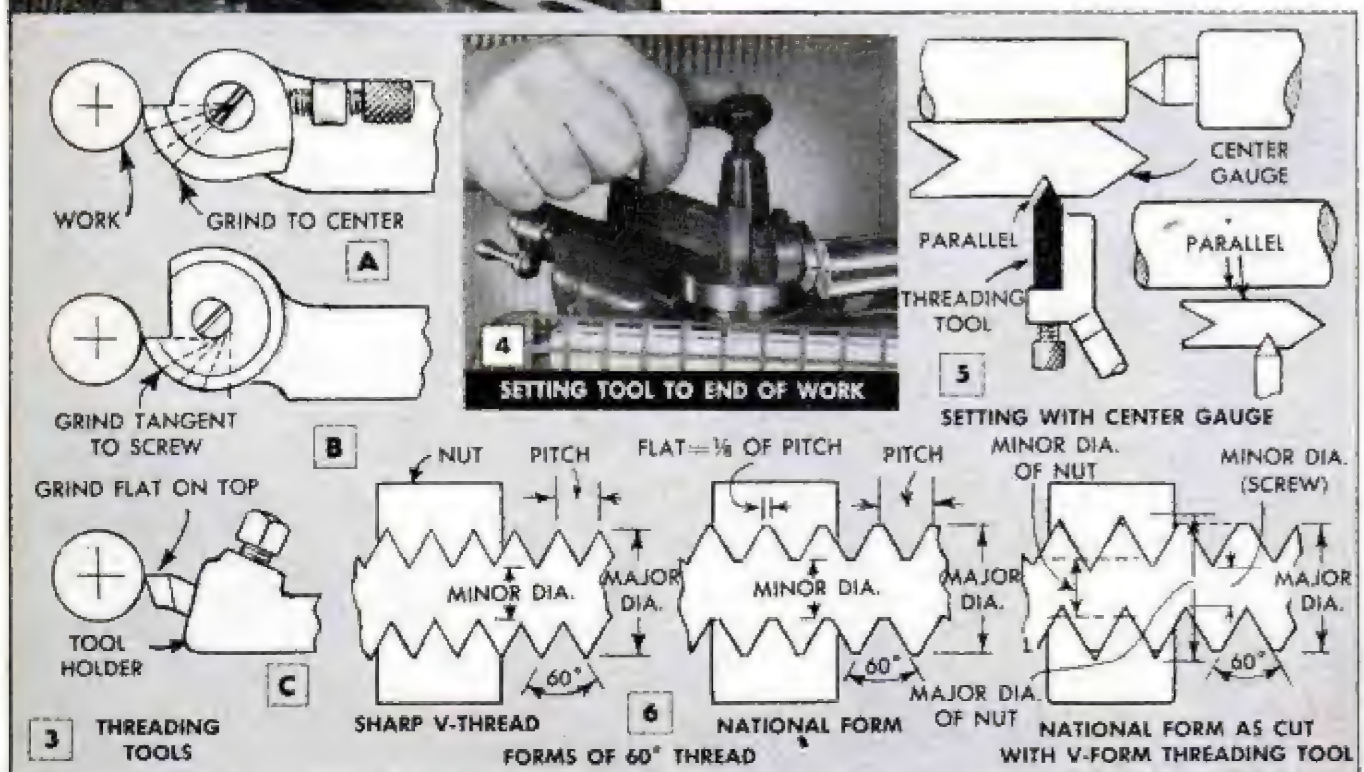


Sighting to a line is a simple and accurate way to set threading tool. Below, how the line is marked

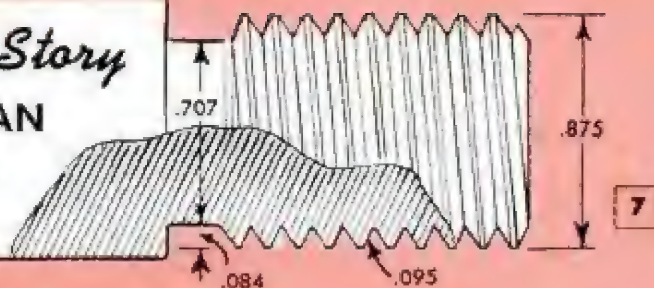


SHOPS SPECIALIZING in work that must meet rigid specifications do thread cutting on a lathe. All the ordinary threading setups are made easily and quickly on a screw-cutting lathe, and thread form, pitch and pitch diameter are easily controlled within very close limits. That's a tip for homecrafters and modelmakers who like to work in metals and whose aim is to turn out work of professional quality. A lathe of the quick-change-gear type speeds up the job considerably, as a simple lever setting of the thread pitch is much faster than selecting and mounting the correct gear in a gear train on the standard lathe. However, you can do very accurate work on either type.

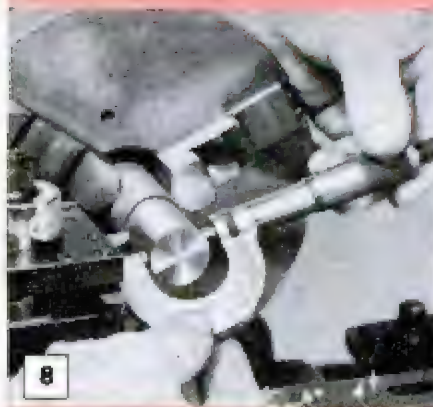
Threading tool: Many machinists like to work with formed threading tools such as the types shown at A and B in Fig. 3. Type A is supplied ready-ground to a 60-deg. angle and is sharpened simply by grinding the top surface of the flat forming the cutting edges. Type B is a circular disk with a beveled edge and is notched to form a cutting edge with its flat surface tangent to the center screw. To compensate for continued below-center sharpening, the disk has an included angle of 65 deg. which actually becomes 60 deg. when ground below



Picture Story CUTTING AN EXTERNAL THREAD



DATA FROM THREAD TABLE	
$\frac{7}{8}$ - 9 THREAD	
MINOR--.707	
BORE--.730	
INFEED--90° .084	
29° .095	



Check with mike to make sure work is not oversize. To produce a good clean thread, turn to a smooth, true, work surface



Before cutting clearance groove, contact work with tool and zero cross-slide sleeve. Then feed in amount given in thread table



This is how the job looks when ready for threading. A slight bevel on thread side of groove gives a sharper, cleaner thread



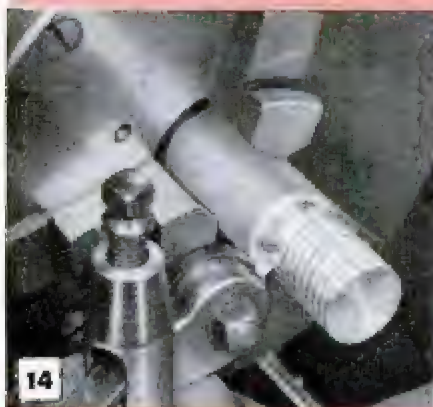
Set gear train, or gearbox, to cut required number of threads. On quick-change lathes gears are lever-set to correct ratios



Mount threading tool and zero cross slide with stop. Then feed compound until threading tool grips piece of paper as shown



Then adjust micrometer sleeve to zero. Many operators simply note reading, but for precise work it's best to adjust sleeve



Infeed about .015 on compound and make first cut. Lathe speed should be about 10 times pitch



Apply threading oil after each pass. Average infeed of .003 to .005 will produce clean thread

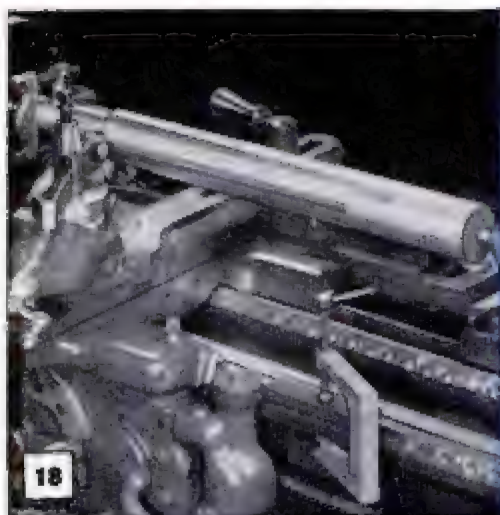


Use side of threading tool to clean up end of work. Some operators use 45-deg. tool for this

THREAD TABLE FOR V-FORM TOOL (100-percent thread)

MAJOR DIA.	TH'DS PER IN.	MINOR DIA.	BORE	INFEED	
				AT 90°	AT 29°
.073"	64NC	.049	.053	.012	.014
NO. 1	72NF	.052	.055	.011	.012
.086"	56NC	.059	.063	.014	.016
NO. 2	64NF	.062	.066	.012	.014
.099"	48NC	.067	.072	.016	.018
NO. 3	56NF	.072	.076	.014	.016
.112"	40NC	.074	.080	.019	.021
NO. 4	48NF	.080	.085	.016	.018
.125"	40NC	.087	.093	.019	.021
NO. 5	44NF	.090	.096	.017	.020
.138"	32NC	.091	.097	.024	.027
NO. 6	40NF	.100	.106	.019	.021
.164"	32NC	.117	.123	.024	.027
NO. 8	36NF	.122	.128	.021	.024
.190"	24NC	.127	.136	.032	.036
NO. 10	32NF	.143	.149	.024	.027
.216"	24NC	.153	.162	.032	.036
NO. 12	28NF	.162	.170	.027	.031
1/4"	20NC	.174	.185	.038	.043
	24NS	.187	.196	.032	.036
	28NF	.196	.204	.027	.031
5/16"	18NC	.228	.240	.042	.047
	24NF	.249	.258	.032	.036
3/8"	16NC	.280	.294	.047	.054
	20NS	.299	.310	.038	.043
	24NF	.312	.321	.032	.036
	27NS	.319	.327	.028	.032
7/16"	14NC	.329	.345	.054	.062
	20NF	.361	.373	.038	.043
	24NS	.374	.383	.032	.036
1/2"	12NS	.374	.392	.063	.072
	13NC	.383	.400	.058	.067
	20NF	.424	.435	.038	.043
9/16"	12NC	.436	.454	.063	.072
	18NF	.478	.490	.042	.047
5/8"	11NC	.487	.507	.069	.078
	12NS	.499	.517	.063	.072
	18NF	.541	.553	.042	.047
	27NS	.569	.577	.028	.032
11/16"	11NS	.549	.569	.069	.078
	16NS	.592	.606	.047	.054
3/4"	10NC	.598	.620	.076	.087
	12NS	.624	.642	.063	.072
	16NF	.655	.669	.047	.054
	27NS	.694	.702	.028	.032
13/16"	10NS	.660	.683	.076	.087
7/8"	9NC	.707	.730	.084	.095
	12NS	.749	.767	.063	.072
	14NF	.767	.782	.054	.062
	18NS	.791	.803	.042	.047
	27NS	.819	.827	.028	.032
15/16"	9NS	.769	.793	.084	.095
1"	8NC	.811	.838	.095	.108
	12NS	.874	.892	.063	.072
	14NF	.892	.907	.054	.062
	27NS	.944	.952	.028	.032
1 1/8"	7NC	.908	.939	.108	.123
	12NF	.999	1.017	.063	.072
1 1/4"	7NC	1.034	1.064	.108	.123
	12NF	1.124	1.142	.063	.072
1 3/8"	6NC	1.123	1.159	.126	.144
	12NF	1.249	1.267	.063	.072
1 1/2"	6NC	1.247	1.284	.126	.144
	12NF	1.374	1.392	.063	.072
1 5/8"	5 1/2 NS	1.349	1.389	.138	.157
1 3/4"	5NC	1.447	1.490	.152	.173
1 7/8"	5NS	1.572	1.615	.152	.173
2"	4 1/2 NC	1.663	1.711	.168	.193
2 1/8"	4 1/2 NS	1.788	1.836	.168	.193
2 1/4"	4 1/2 NC	1.913	1.961	.168	.193
2 3/8"	4NS	1.996	2.050	.189	.216
2 1/2"	4NC	2.121	2.175	.189	.216
2 3/4"	4NC	2.371	2.425	.189	.216
3"	4NC	2.621	2.675	.189	.216
3 1/4"	4NC	2.871	2.925	.189	.216
3 1/2"	4NC	3.121	3.175	.189	.216
3 3/4"	4NC	3.370	3.425	.189	.216
4"	4NC	3.620	3.675	.189	.216

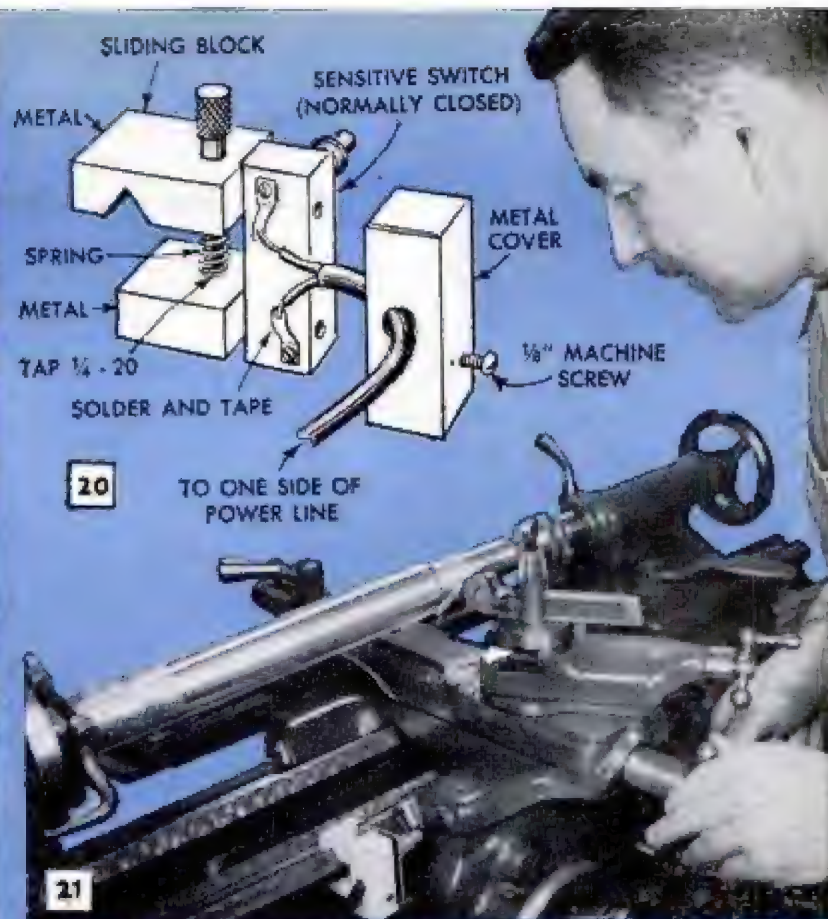
Figures given above are for 100-percent full thread. It usually is best to allow a tolerance of about 10 percent of the single depth of thread when fitting mating parts. For example, to cut 7/8-in.-dia., 9-pitch thread: Under "Infeed at 90 deg." read .084 which is single depth of thread, 10 percent of this value is .008. Turn external thread undersize by half this amount (.004) and add remaining .004 to bore dia. for the internal thread. For odd sizes, infeed for any thread is read under "Infeed at 90 deg." disregarding dia. Thus 40-pitch thread always takes .019 infeed. If compound is set at 29 deg. for infeed, then the infeed for the same thread would be .021 as listed in right-hand column under "Infeed at 29 deg."



18 CARRIAGE STOP CLAMPED TO BED



19 THREAD STOP ON CROSS SLIDE



20

TO ONE SIDE OF
POWER LINE

21

Stops are an aid to fast, accurate thread work. An electrically operated stop, pictured and detailed above, is also useful for lathe jobs other than threading. Photos at left show two types of simple mechanical thread stops

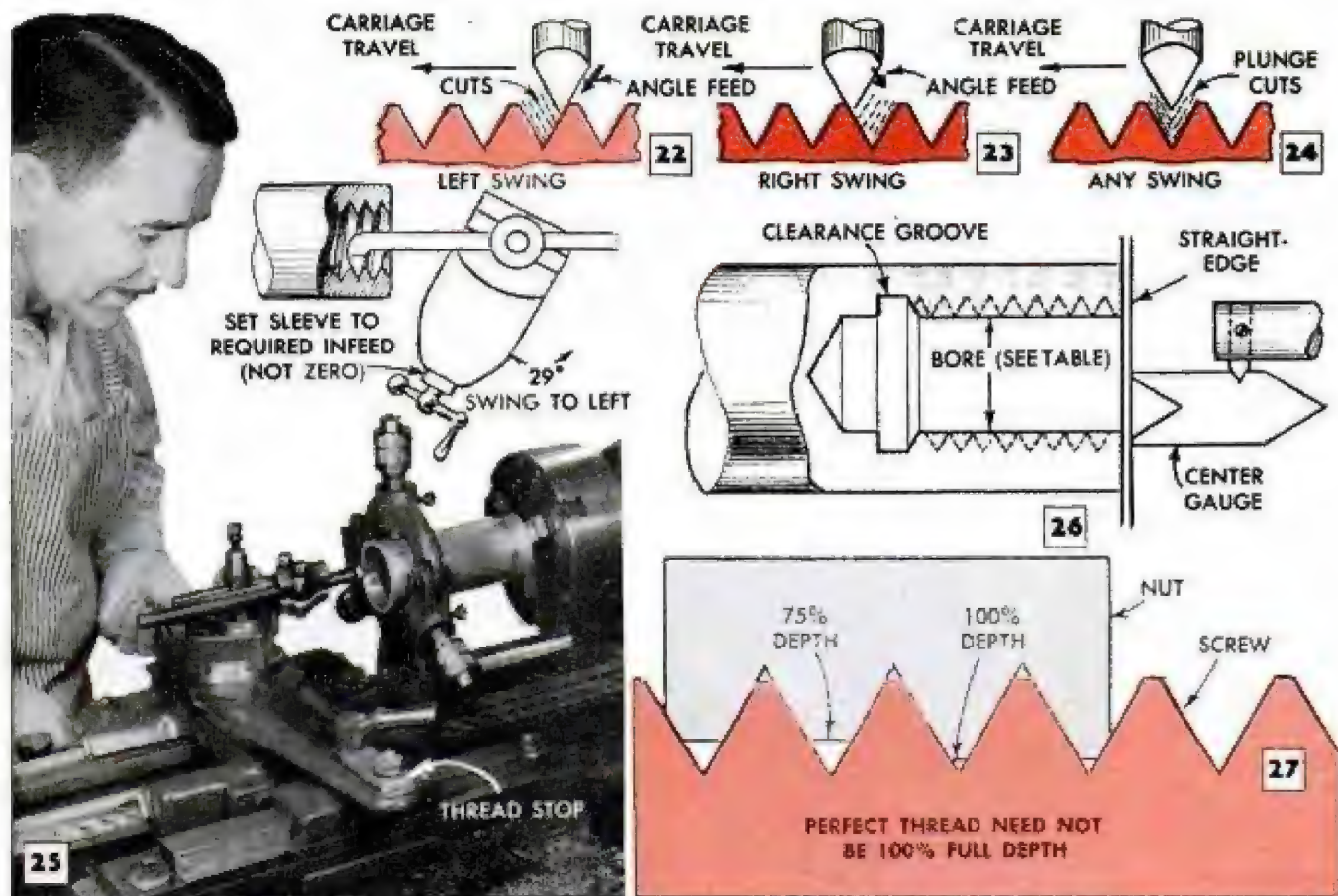
center as indicated. Individual tool bits for threading can be purchased ready-ground or in the rough and ground as required. In all cases the cutting edge of the tool is set level and exactly on the work center line as in detail C, Fig. 3.

Setting the tool: In order to cut a true thread shape the tool must be set square with the work. A common method is to use a center gauge as in Fig. 5. When using a formed threading tool it is practical in most instances to align the side of the tool with the end of the work, Fig. 4, or by means of a scribed line, Figs. 1 and 2.

Thread forms: Fig. 6 details the sharp V-thread and the American National form, the latter thread having a flat at the crest and also at the bottom. The sharp thread is not used extensively as it is difficult to cut in certain metals. The National form is ideal but requires grinding a flat on the threading tool. Since the flat will vary with each thread pitch, many operators compromise by cutting a thread with a sharp V-bottom and a flat crest. However, unless compensation is made, there will be a slight variation in the major and minor diameters of the screw and nut, Fig. 6, often sufficient to prevent the nut from turning onto the thread. The thread table, Fig. 17, makes

the necessary corrections. From Fig. 17 it will be noted that values in the column headed "Bore" run a trifle larger than the minor diameters. Even with this addition to the bore size for internal threads, the values given are for a theoretical 100-percent thread which is seldom used in practical application. A 95-percent thread rates as top-quality work.

Cutting the thread: This is a simple job. Figs. 7 to 16 inclusive show the typical procedure, although there are many variations in the routine pictured which are more or less a matter of personal preference. Most operators use the angular compound infeed as this advances the tool alongside the thread and produces a clean chip. Plunge cuts made with the cross-slide infeed are often used for rough work. When cutting standard thread sizes, catching the thread with the dial is a fairly universal practice. For odd thread sizes it may be more convenient, and more accurate, to use the reverse feed, as engagement can then be made at any position. Once engaged the split nut cannot be disengaged from the lead screw until the thread is complete. In this case, the cross slide is backed at the end of the cut and the lathe reversed to return the carriage to the starting position.



If compound is used for infeed it should be swung to left when cutting internal threads. Before starting cut, depth of thread is set on compound sleeve. Sleeve will show zero when thread is complete

A simple rule of thumb for threading speeds is 10 times the pitch. For example, if you are cutting a 24-pitch thread, use a speed of approximately 240 r.p.m. Long threads may require a reduction in speed and use of a backrest to prevent chatter.

Stops: A thread stop eliminates any inaccuracies when returning the cross slide to the zero position for each pass. Some operators prefer the type of stop shown in Fig. 19, especially on small lathes on which a thread stop is supplied only as an accessory. An equally effective improvised stop is shown in Fig. 25 but is suitable only when the lathe is fitted with a taper-turning attachment. It can be used when cutting either internal or external threads. A stop for the carriage is useful in nearly all types of work, and especially when threading from a shoulder as in Fig. 18. In this setup a short piece of metal is clamped to the lathe bed to stop the carriage at exactly the same spot for successive cuts. Many operators prefer an electrically operated stop, Fig. 21, which opens the circuit and stops the motor when the carriage reaches the limit of travel. Although not a perfect device for all thread work, due to "coasting" of the lathe after the power is cut off, it is especially useful when working to clearance grooves, Fig. 26, on both internal and external work. An improvised, electrically operated stop is detailed in Fig. 20 and

shown in Fig. 21. Ready-made micrometer carriage stops also are widely used in thread work.

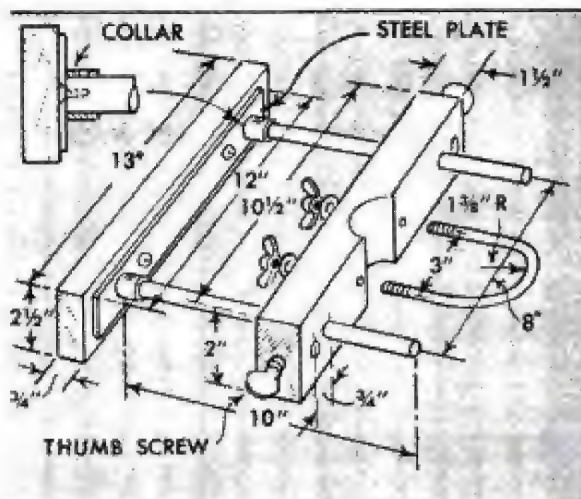
Internal threads: If the compound infeed is used when cutting internal threads, most operators set it at 29 deg. left swing. In this position the successive cuts are made in the same direction as the carriage movement, Figs. 22, 23 and 25. Note that when the compound is used in this way, the initial setting of the micrometer screw is for the full depth of the thread. For plunge cuts, Fig. 24, the compound can be set in any position.

Except when cutting very fine threads, it's common practice to cut internal threads somewhat less than full depth. So far as shake and end play are concerned, a 75-percent thread can be perfect, Fig. 27. If internal work is bored for a 75-percent thread the amount of infeed is reduced 25 percent. It will be seen from Fig. 27 that an extra cut can be run on either the internal or external thread without changing the basic diameters. However, in actual practice, even this variation is not enough to entirely eliminate interference at the crests. Unless the thread is subjected to excessive stress, or if accuracy requirements make it necessary to reduce tolerances to the minimum, it's usually good practice to work external threads slightly under the basic measurement and internal threads slightly over.

★ ★ ★

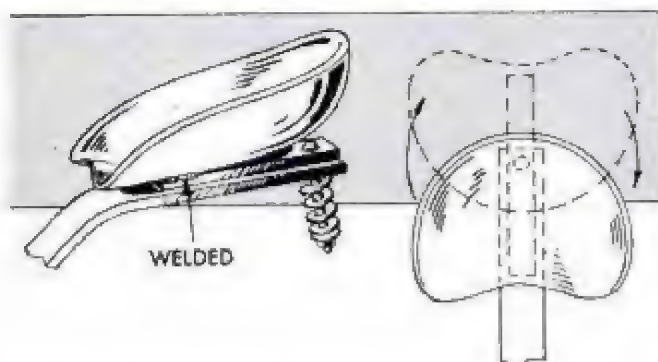
Drill-Press "Fence" Helps Steady Stock for End Drilling

As normally there is no provision for holding work vertically in a drill press, it is difficult to steady work on end for drilling the end grain. With this adjustable hardwood "fence," however, your vertical drill press will prove as efficient as the horizontal type for drilling, routing and mortising end grains of any work short enough to fit between the bit and the table or base. Adjustment is made possible by means of two rods attached to the back of the fence which slide in holes drilled in a crosspiece that is clamped to the drill-press column. Cut semicircularly in the center to match the radius of the column, the crosspiece is held by a U-bolt secured with wing nuts. The fence is mounted with screws to a steel backing plate, which in turn, is screwed to ends of the rods. The rods are drilled and tapped for 10-32 machine screws, while holes in the plate are countersunk for heads of the screws. Before plate is attached, collars are slipped over ends of the rods and



secured with setscrews so they project about $\frac{1}{32}$ in. beyond the ends. In this way, the plate seats squarely on the ends of the rods when the machine screws are drawn up. To lock the fence in position, the ends of the crosspiece are fitted with $\frac{1}{4}$ -20 thumb screws. Short lengths of $\frac{1}{2}$ -in. shafting, drilled and tapped for the thumb screws, are inserted crosswise in the crosspiece to serve as nuts for the thumb screws. When using the fence, align a straightedge directly beneath the fence and clamp it to the drill-press table to provide a rest for the work.—Arthus A. Volz, Dayton, Ohio.

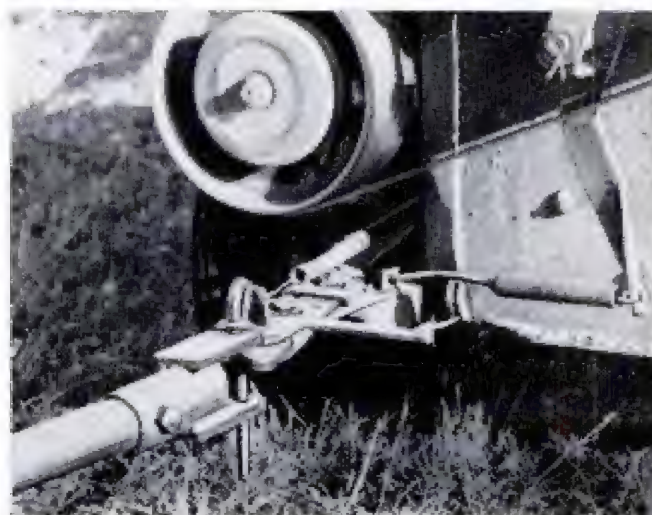
Farm-Tractor Seat Pivoted to Swing Out of Way



One farmer who finds it more comfortable to stand when driving his tractor over ridged rows of corn or rough ground, pivoted the tractor seat so that it can be swung out of the way when not wanted. He welded the seat to a length of flat steel and then drilled both the steel and the seat arm to take a long bolt. A heavy spring provides sufficient tension to keep the seat from moving out of position, but allows it to be turned without loosening the nut.

Trip Hitch Mounted on Hay Chopper Helps Speed Harvesting

To help speed the harvesting of hay, one farmer mounted a jaw-type trip hitch on the back end of his hay chopper as shown in the illustration. The hitch makes it possible for the operator to disconnect a loaded wagon without getting off the seat by pulling a trip rope. The hitch was attached with only one bolt so that it could pivot when making turns. To prevent possible fouling of the trip rope, it was attached to a heavy wire run through $\frac{1}{2}$ -in. tubing along the frame of the chopper.

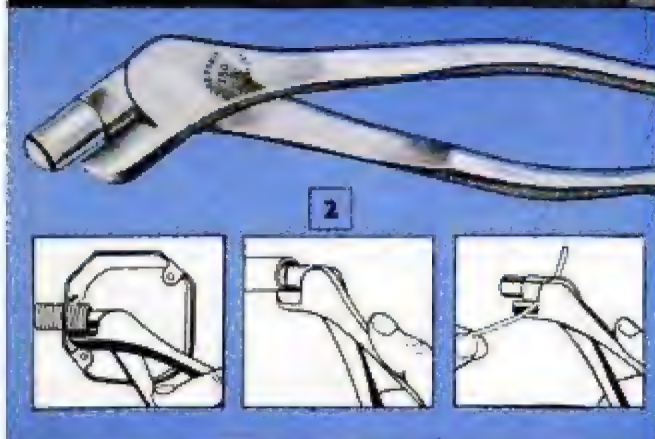


⌚A dragging brake on the wheel of an automobile sometimes is caused by a weakening of the brake-shoe return spring.

SHOPPING FOR TOOLS



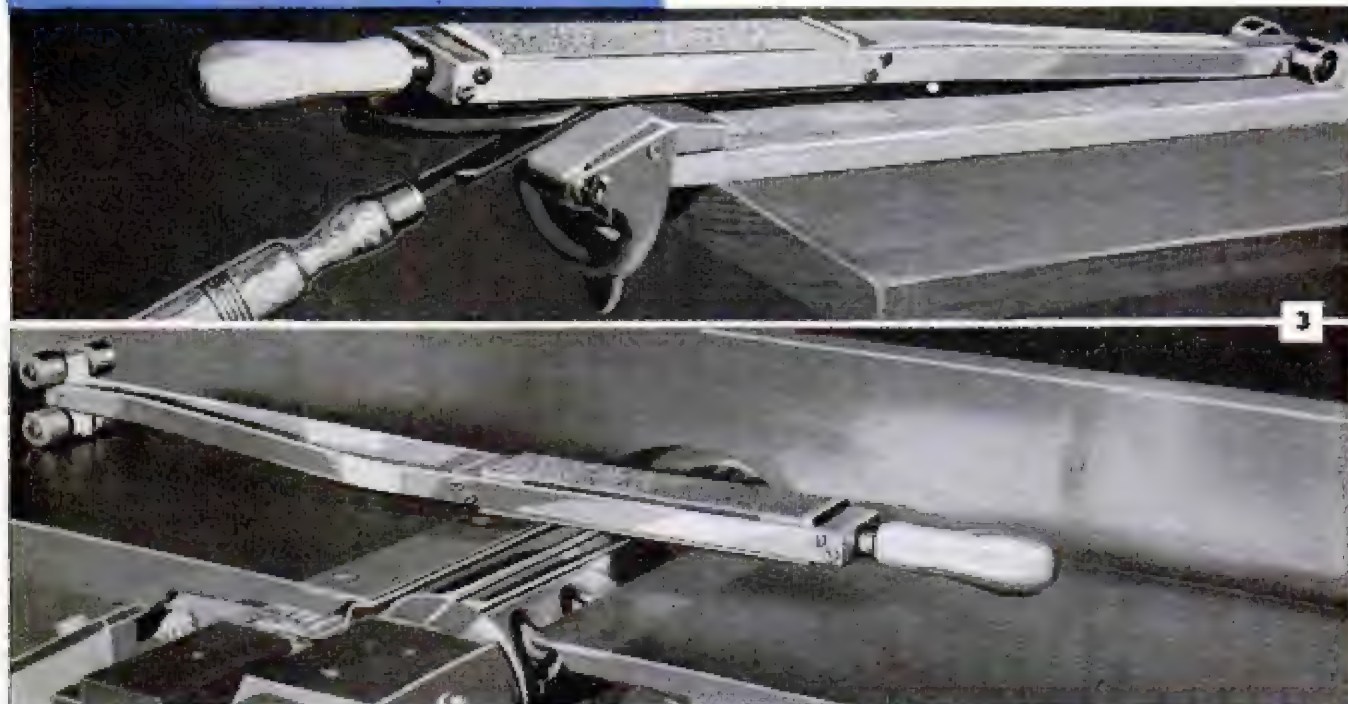
1. QUICK-ACTING FASTENER for attaching asbestos siding to various types of insulating sheathing consists of a special nail and clinching tool which locks the nail with a simple twist. Nail is first driven through the face nail holes in the siding until it projects about an inch from the inside surface of the sheathing. Then the tool is placed in position as in photo. A quick twist clinches the nail firmly

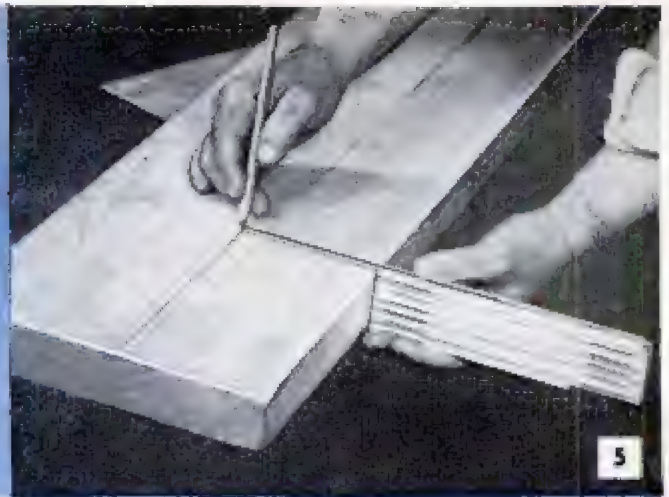
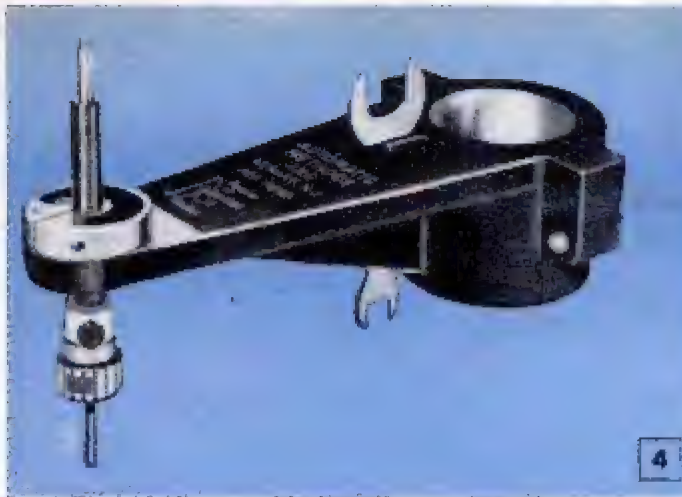


2. ELECTRICIAN'S LOCKNUT PLIER is designed to do three jobs. First, a roller jaw slips inside the end of thin-wall conduit and lower jaw engages lug of locknut. A single twist tightens the nut as in left-hand detail. Second, roller jaw removes slight burr from the cut ends of conduit as in the center detail. Third, the sharpened lower jaw cuts and removes insulation from ends of wires as shown in right-hand detail

3. HAND-HONING TOOL produces a razor-keen cutting edge on chisels, plane irons and also hones the knives on certain power tools, such as the jointer shown in the lower photo. Roller guides at the forward end of the movable jig produce a true, straight edge and a uniform bevel throughout the width or length of the cutting edge. Unit is designed to hold the hone securely. Either side of hone may be used

4. TAPPING ATTACHMENT for drill press features an improved lead screw designed to take load off the tap, preventing breakage and scored threads. Adjustable lead nut, collet and spindle are supported on a rigid arm which attaches to drill-press column. Lead nuts are available in pitches ranging from 20 to 80. Collet permits self-alignment of tap in the tap hole, avoiding shank breakage



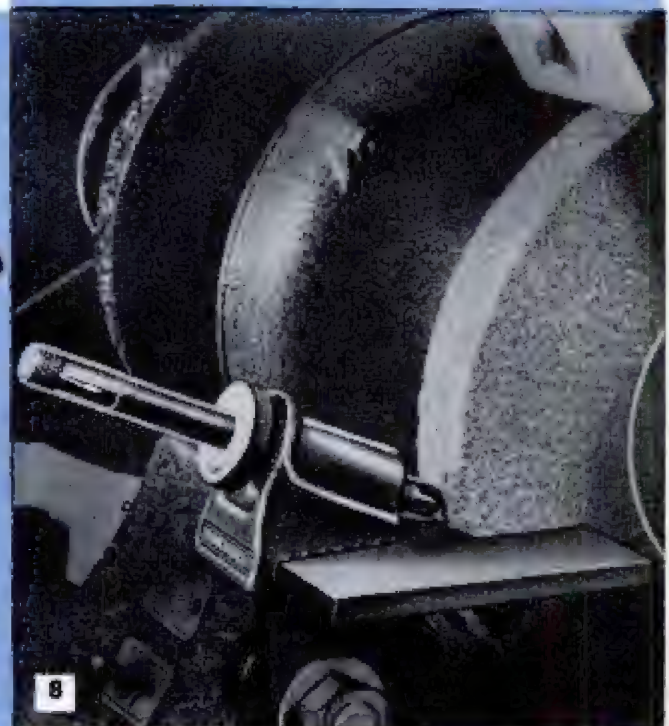
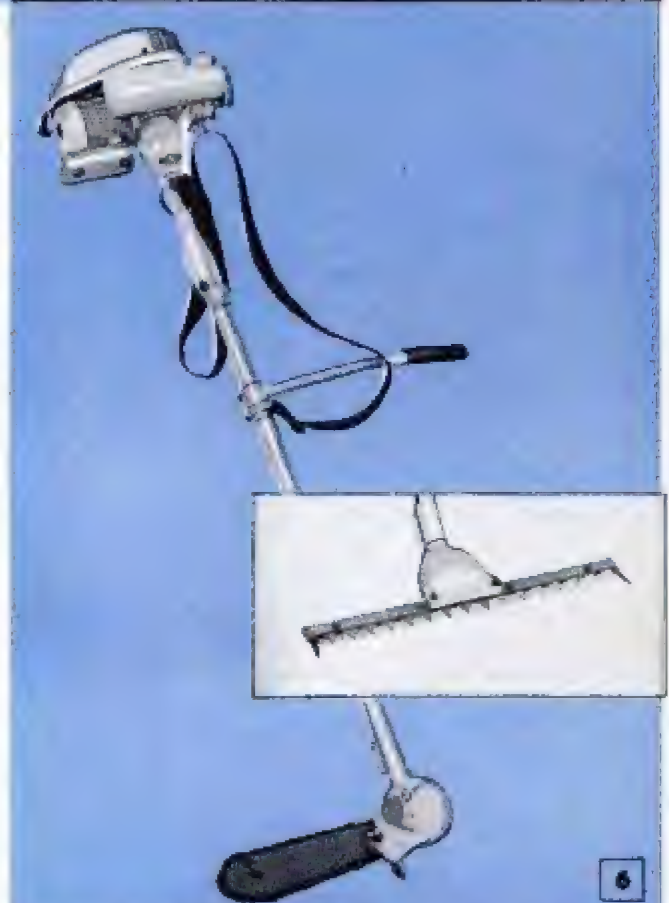


5. EXTENSION RULE has squared ends which permit it to be used as a marking gauge, hook rule and as an inside rule, using the brass sliding extension in the first leg. Each joint opens on an even number, facilitating quick readings and accurate measurements. New-type joints open and close more easily

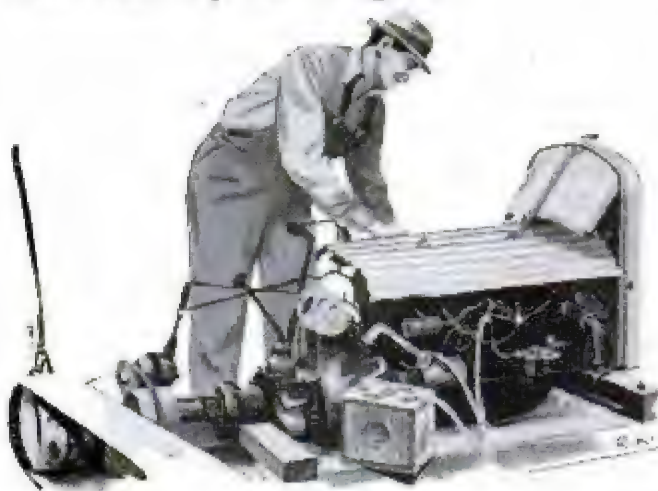
6. COMBINATION POWER SCYTHE AND CHAIN SAW weighs only 26 lb. and is operated by hand with the aid of a shoulder strap. Driven by 2 hp., air-cooled engine, the chain-saw attachment has a capacity of 6 in. and the cutter bar cuts a swath 20 in. wide. Has automatic centrifugal clutch and roller-chain drive

7. SAFETY SWITCH for portable electric drills requires insertion of the chuck key in a special socket before drill motor can be started. Removing chuck key opens the circuit and makes drill switch inoperative. Eliminates the possibility of injury to operator when changing drill bits. Fits all drills

8. ADJUSTABLE DIAMOND DRESSER is especially designed to fit onto the tool rest of small grinders. Diamond holder slides in the sleeve of the holder which is guided by the machined edge of the tool rest. Trues both the face and side of the wheel, and is adjustable for angle-dressing the face of the wheel



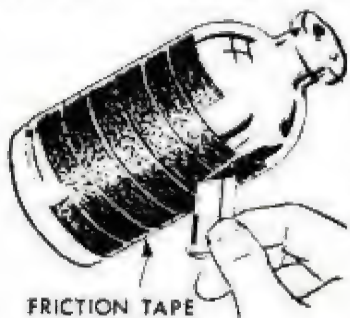
Power Unit for Hammer Mill Provided by Car Engine



By using an old car engine as a stationary power unit for operating his hammer mill, one farmer not only avoids additional wear on his tractor but also keeps it free for other duties. The engine is mounted on a timber frame outside the building that houses the mill, and supplies power by means of a flat-belt drive. The drive shaft consists of the hub, over which the pulley is fitted, and part of the rear axle of a car running in a pillow-block bearing. A tractor governor, which is driven off the shaft by a V-belt, keeps the speed of the mill uniform. For protection from the weather, the engine is covered by a section of metal roofing which is bolted in place. To eliminate the troublesome possibility of water in the fuel line or tank, the line was cut so that the end may be placed in a 5-gal. can of gasoline whenever the engine is readied for use.

A. M. Wettach, Mt. Pleasant, Iowa.

Precut Electrical-Tape Strips Held in Readiness on Bottle



When making electrical repairs, it is convenient to have your friction tape at hand and already cut into handy strips. To do this, one electrician advises that the tape be wrapped spirally around a bottle and cut with a single slash of a knife or razor blade. The strips then may be peeled from the bottle as needed.

Knurling Removes Shaft Play

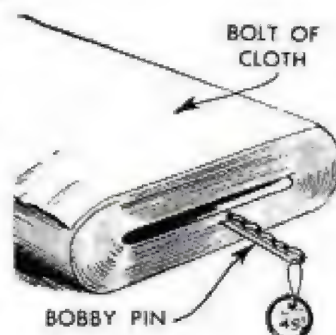
In some cases, shafts become worn at the point where bearings ride, resulting in shaft play even after new bearings have been installed. One way to remedy this is

to chuck the shaft in a lathe and knurl the surface that contacts the bearing. This will serve to upset the metal and thus increase the diameter of the shaft sufficiently to make it fit snugly.

Carelton Phillips, Corning, N. Y.

Tags Attached to Cloth Bolts With Bobby Pins

Instead of having to pull out the last fold of cloth on a bolt of yard goods in order to attach string tags, which he usually stitched to the material, one merchant attaches the tags to bobby pins



and inserts these so that they clip firmly over one or more folds of the cloth. By attaching the tags in this way, the job can be done much quicker and any possible damage to the cloth is avoided.

Electrically Etched Nails Have Greater Holding Power

Common nails can be etched with a small home welder of the transformer type to give them greater holding power. Ground a large piece of steel, such as a section of railroad rail, and place each nail to be etched in the electrode holder of the welder. With the current on, drag each nail across a corner of the grounded steel in the manner indicated. Each time it arcs, the nail will be indented and a slight sharp-edged hump will be raised.

Lincoln Electric Co., Cleveland, Ohio.



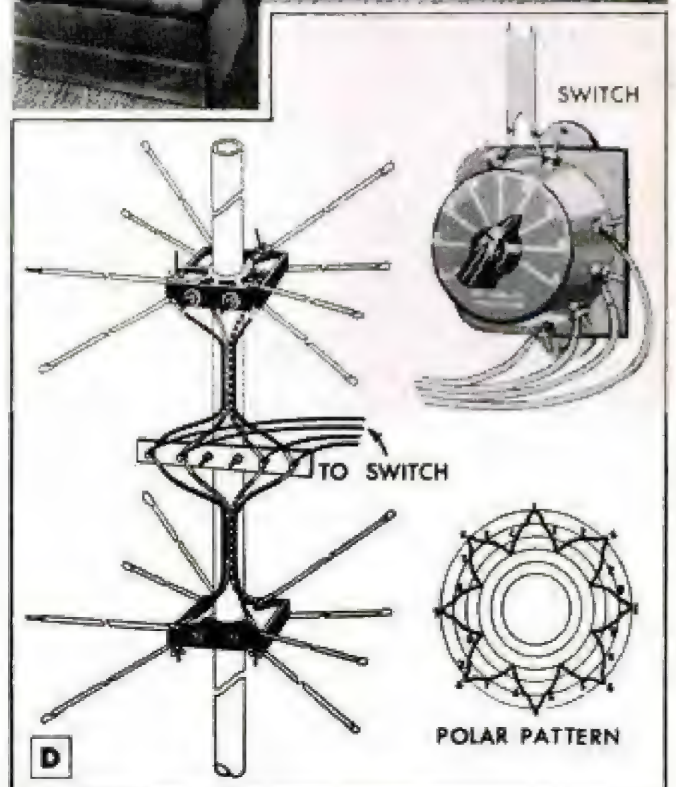
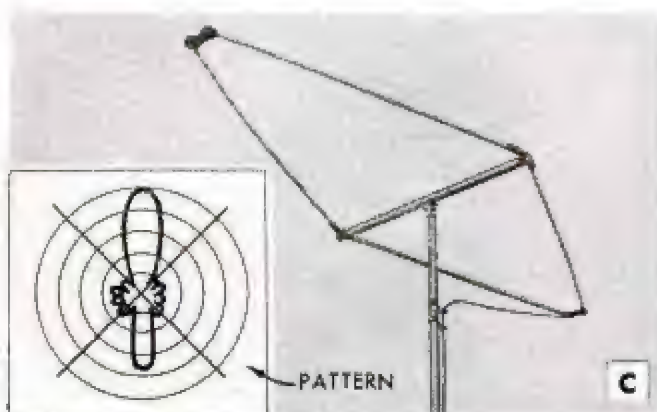
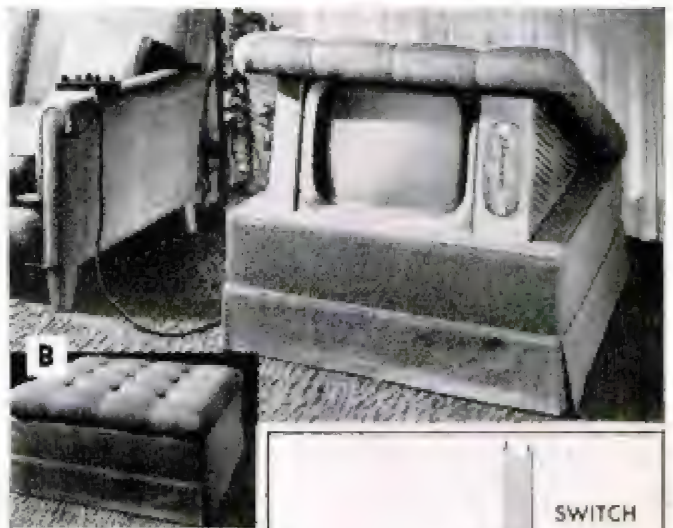
TELEVISION TODAY

TV SERVICEMEN working in the home, can now measure high accelerating d.c. voltages on a TV picture tube without removing tube or chassis from the cabinet by means of the portable probe-type voltmeter shown in photo A. It is light in weight, 10 in. long and is completely self-contained. The serviceman merely connects a clip to the set chassis; the probe end of the timesaving device is then connected to the second anode of the TV picture tube by piercing the rubber protective cap. A knob on the Voltprobe is turned down until a lamp on the inside lights; voltage is then read off a dial.

Perhaps one of the most unusual cabinets for housing a television receiver in small apartments is the TV ottoman illustrated in photo B. It is on rollers and takes care of seating needs as well as housing a concealed TV set with a 20-in. screen.

Rhombic-antenna systems are not new to amateur radio hams and commercial radio installations beaming transmissions to and from foreign countries. Now, in the decidedly miniature form, photo C, they will bring in the new UHF-TV programs from local stations with the same narrow-beam horizontal directivity over the entire UHF spectrum and are claimed to eliminate ghosts and interference. The highly directive pattern is shown.

The stacked TV-antenna array, shown in illustration D, is claimed to have a 22-db gain over a tuned dipole. It is also claimed to extend fringe-area reception an additional 40 miles. Reception is "all direction" by means of the special switch without motor rotation. It is nine antennas in one; for broad-band VHF-UHF and FM reception.





"BIRD LISTENER"

By William Gilman

EVERYBODY knows about "bird watchers" and "bird hunters" who use a camera instead of a gun—but "bird listening" and recording are new methods of outdoor hunting that are as fascinating—and challenging—as shooting with a camera. "There is more to it than taking aim and firing," says Prof. Peter P. Kellogg, the Cornell ornithologist who hunts mountain, jungle and field for bird twitters, chirps and assorted sounds, in addition to alligator bellowing, monkey howling, thunderstorms raging and gentle rain falling—all fair prey for his world-famous "Library of Natural Sounds."

With latest tape recorders weighing under 10 pounds now available, there will be probably many more bird listeners in our woods and bird sanctuaries. As with amateur photography, some shots may turn out fine, many may be out of focus or fail due to the use of equipment unsuitable for nature's sound frequencies. Often inexperienced microphone handling allows the main subject to be drowned out by background noise. A mosquito buzzing across the microphone can sound like a bomber, even a babbling brook, or leaves rustling in the breeze can drown out a shy bird's song.

Much of Professor Kellogg's know-how involves either stealing nearer to a bird or enticing bashful ones closer by tricky use of a parabolic reflector that works like



USES A TAPE RECORDER

field glasses to bring the sound in louder. Then Professor Kellogg plays the recording back to the bird, which jealously comes closer to sing right into the hidden "mike." Of course, that is not all; much of Kellogg's success comes from his laboratory work on the editing end—here he cuts out unwanted noise and splices strips of successful footage together to make the final master tape recording from which records are made for sound movies.

Photo A shows Professor Kellogg setting up to "shoot" a shy bird for sound. He mounts his parabolic reflector on a tripod and inserts a dynamic microphone in the center of the reflector. The cable will pipe sound back to the tape recorder inside the car. In photo B, he is taking off with the sound-pickup equipment—and is dragging the shielded cable. After setting up the reflector and microphone at the desired location, Professor Kellogg returns to the car for the recording operation illustrated in photo D. The tape recorder is directly above him and the audio amplifier is at his left.

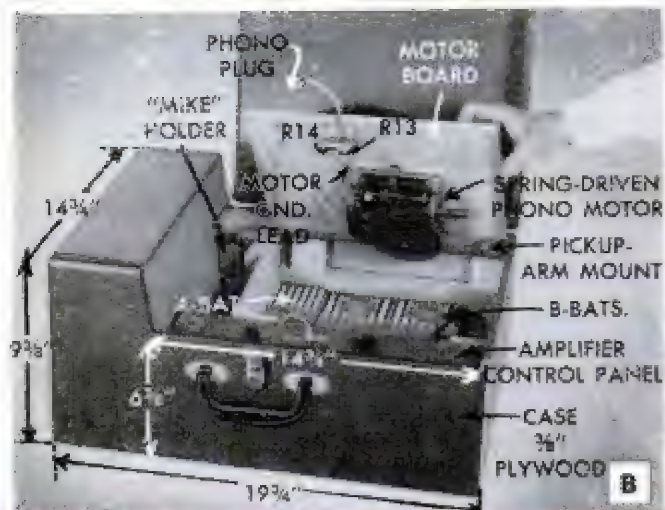
After completing the recording, the parabolic reflector is strapped to the rear of the car, as in photo C, for the return trip to the laboratory, photos E and F, for editing.

Photo G shows Professor Kellogg seated on a high-fidelity-speaker enclosure in his sound studio at Cornell, listening for tone quality in the sound track he's preparing for a sound movie feature for New York State school children. ★ ★ ★



MULTI-PURPOSE BATTERY-OPERATED

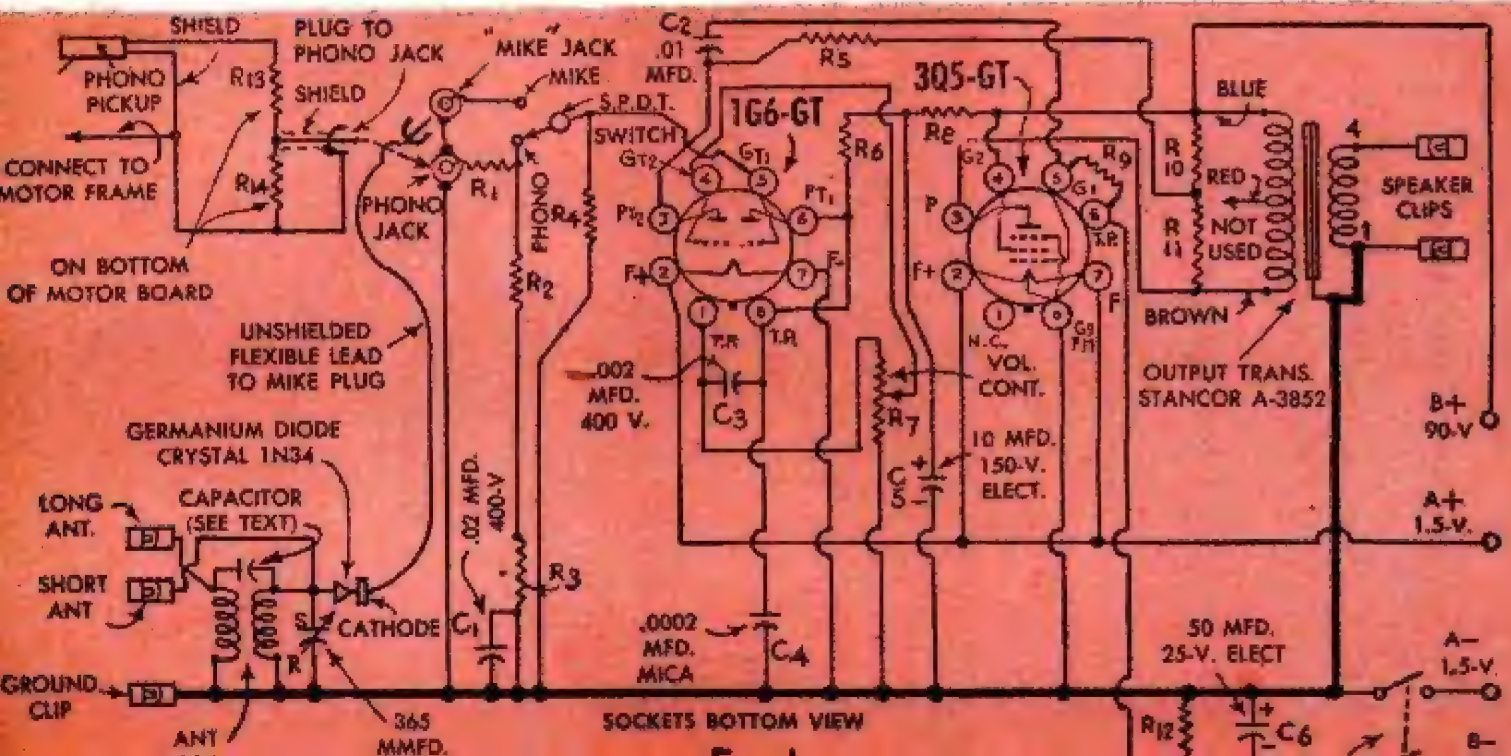
By Dr. R. C. Hitchcock



JUST FOR FUN build this 2-tube battery-operated audio amplifier and you will be surprised at the number of entertaining uses you will find for it. As a portable amplifier for a spring-wound record player, you can take this unit on a picnic, to the hunting lodge, to the beach—anywhere away from a power line—you'll be the life of the party. Provision has been made for using a small crystal microphone and it's a lot of fun in a group to have each try his voice on the mike. Most everybody talks too fast, some get mike fright and others pitch their voices unnaturally high. Placing the mike is an art; too close to the loudspeaker is bad. You can learn a lot about PA (public-address) systems from this flexible portable outfit.

Another entertaining feature is a built-in germanium-diode crystal detector and tuner that will get clear signals from nearby AM broadcasting stations. There are two antenna posts (clips), one for a short antenna about 10 ft. long; the other clip is for a longer antenna if required. Often a 10-ft. wire, held up high at one end and connected to the short antenna clip at the other, with another wire of similar length connected to the ground clip, and lying on the ground, will give very nice headphone reception. Use a good pair of 2000-ohm headphones. Merely disconnect the wire at the speaker clips and connect the phones.

The schematic circuit diagram is given in Fig. 1 and the pictorial diagram appears in Fig. 2. Photos A and D show front and rear views of the 2-tube breadboard-type amplifier which can be built by any beginner



AUDIO AMPLIFIER

For Beginners

who can solder and follow a diagram: however its quality and wide possibilities may also appeal to the advanced experimenter. The 3Q5-GT and 1G6-GT battery-type tubes, and all amplifier components are standard parts. The front panel and base details are given in Fig. 3. The exact height of the $\frac{1}{4}$ -in.-plywood front panel is not critical and may vary a little depending upon the available space in the portable carrying case used. The case shown in the photos is a commercial type designed to house an amplifier, 8-in. PM speaker, phono motor and turntable. It is covered with two-tone brown simulated leather and lists in parts-house catalogues for about \$13.00. For those who wish to make their own, over-all dimensions are given in photo B. The phono-motor mounting board is $3\frac{1}{8}$ x $10\frac{1}{8}$ x 12 in. The cutout for the spring-wound

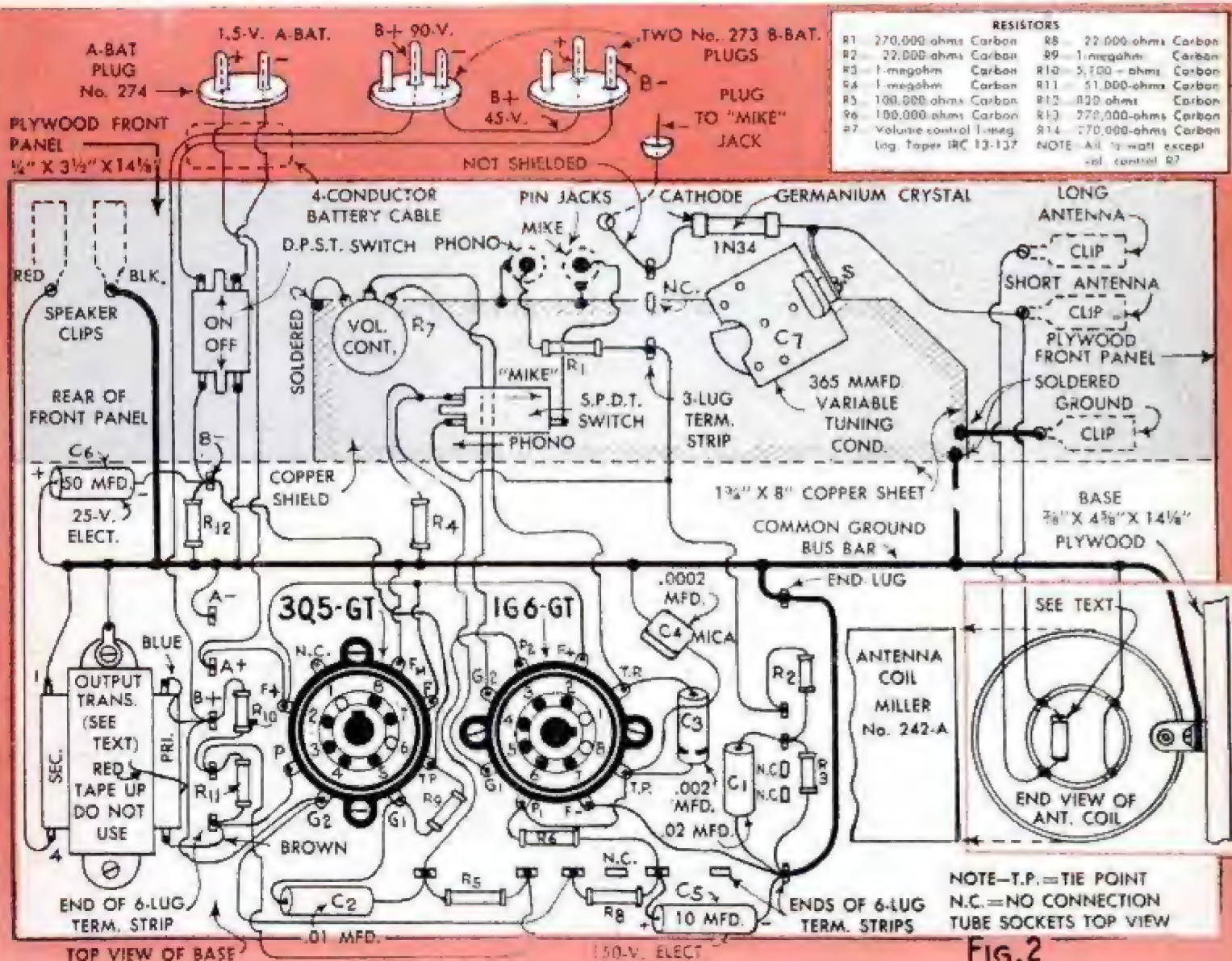
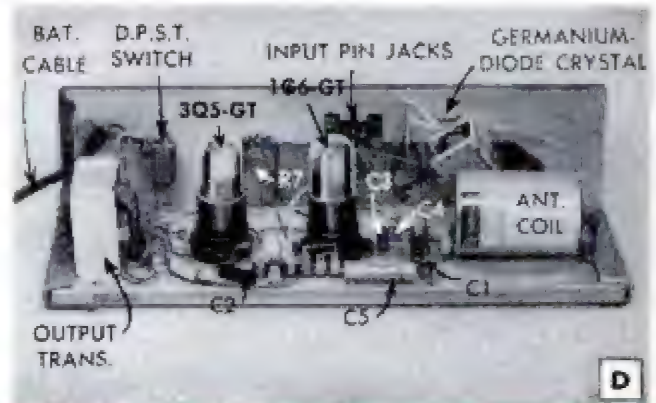
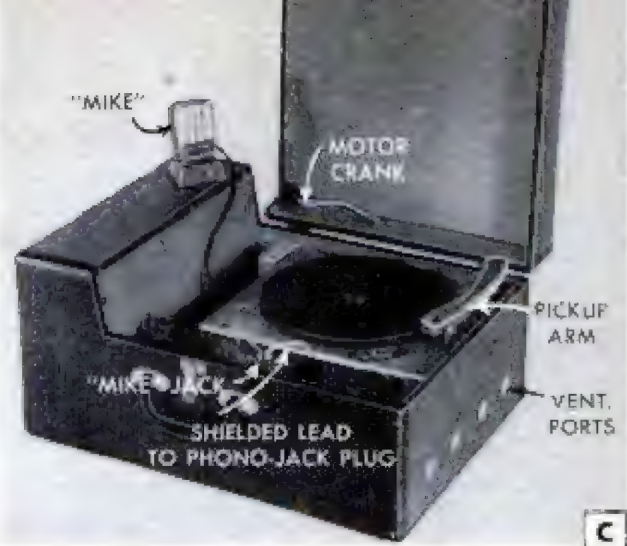
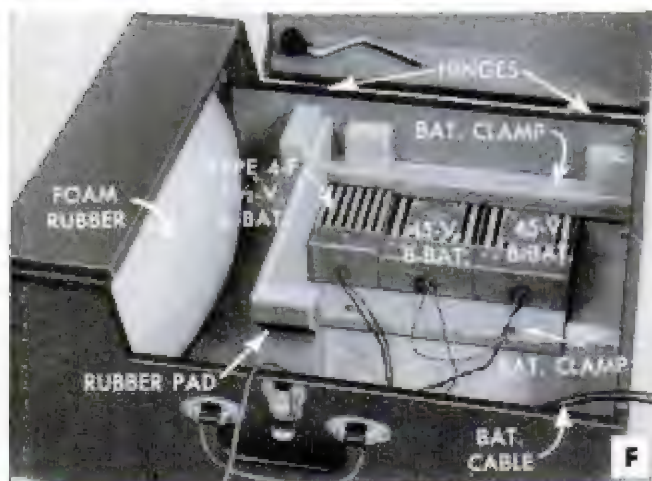
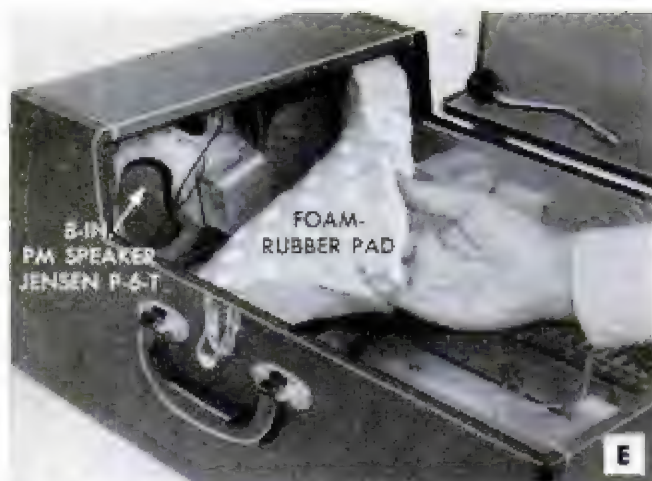


FIG. 2

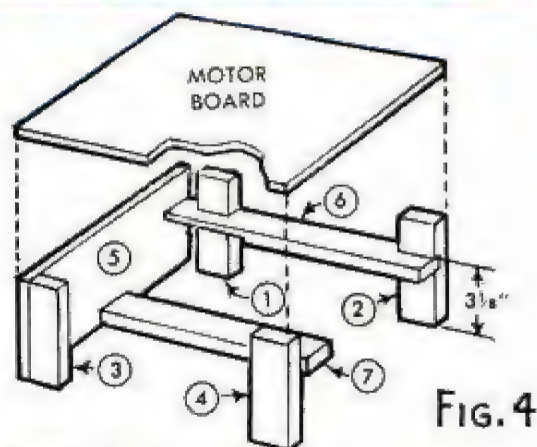
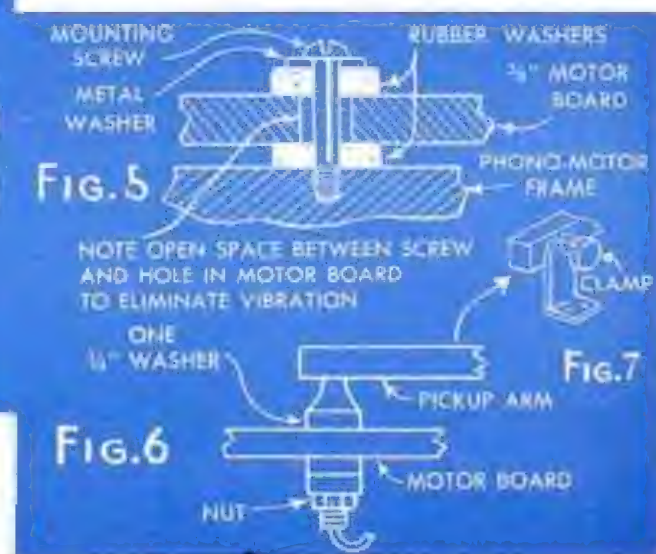
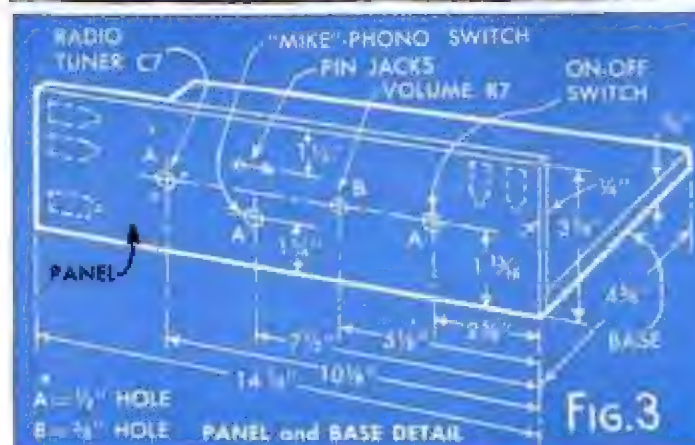


phono motor will depend upon the type used. Useful, spring-wound phono motors may be found in many storerooms and attics and some are still available in stores. This construction article was primarily designed to use salvaged spring-wound motors and turntables in answer to a popular demand from readers of this magazine.

A type 4F 1½-volt A-battery and two type A30 45-volt B-batteries are employed to power the audio-amplifier unit. These are Burgess type. Equivalent RCA batteries are type VS004 A-battery and type VS014 B-batteries. The Sears numbers are 6430 and 6460; Montgomery Ward numbers are 21 and 31 respectively. Using these batteries 4 hours a day, the expected life is about 2 weeks. Remove the batteries if the set is not to be used for some time.

Photos B, C, E and F show various views of the completed assembly in the case. In Fig. 4 all construction details are given for the motor-board mounting posts and battery clamps. Several pieces of ¼-in. sponge rubber are used to separate the amplifier base and panel from the rest of the cabinet. A 1½-in. piece of foam rubber is used behind the PM speaker as shown in photos E

(Continued to page 248)



ITEM	REQD.		
1	1	3/4" X 4 7/8" X 1 3/4"	POST
2	1	3/4" X 4 7/8" X 1 3/4"	POST
3	1	3/4" X 4 7/8" X 1 3/4"	POST
4	1	3/4" X 4 7/8" X 1 3/4"	POST
5	1	3/8" X 10 1/8" X 4 7/8"	SIDE
6	1	1/4" X 11 3/8" X 1 1/4"	BAT. CLAMP
7	1	5/8" X 11 3/8" X 9 1/2"	BAT. CLAMP





"OLD 16" RIDES AGAIN WITH CHAMPIONS!

After nearly a half-century, legendary "Old 16," first American winner of the Vanderbilt Cup, still takes 100 miles per hour in its stride. This ancient Locomobile uses Champion Spark Plugs—as do the great majority of today's record breakers.

Apart from its historical significance, "Old 16" serves as a prime example of the value of proper care in protecting your motor car. And proper care should include Champion Spark Plugs. Why Champions? Because the vast majority of engine experts agree that Champions will make any car, old or new, run better.

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Mr. Peter Helck, internationally-known artist and automobile connoisseur, is the owner of "Old 16." This car was designed by A. L. Riker and driven to its greatest triumphs by "Dare-devil" Joe Tracy and George Robertson.



FOLLOW THE EXPERTS

Demand
CHAMPIONS

FOR YOUR CAR!

See how filters can improve your summer snapshots

Nothing could be simpler! Slip an inexpensive Kodak Wratten Filter over your camera lens for new realism and interest in your outdoor black-and-whites.

Preview your results in the filter ex-

amples shown below. Get ready now to take your best summer and vacation pictures. Have your Kodak dealer fit the right filters to your camera. Prices? Very reasonable, from \$1.75.

Without filter



Normal Photograph—This snapshot has good composition but little else. The sky is especially flat.



Normal Photograph—Again this is a nice album snapshot—everything in order, but without real life.



Normal Photograph—Here you need a green filter to emphasize foliage and clouds and improve skin tones.



Normal Photograph—A "bare" lens has missed the excitement of this potentially dramatic shot.

With filter



Taken with Yellow (K2) Filter—Picture now has life, quality. Skies are darkened, clouds well defined.



Taken with Yellow (G) Filter—More powerful. Gives you even more sky emphasis, more drama.



Taken with Green (X1) Filter—See the difference? It's simple to do the same for your pan film snapshots.



Taken with Red (A) Filter—You get the ultimate in dramatic contrast, with pan and infrared films.



Normal Close-Up



With Kodak Portra Lens 1 +



With Kodak Portra Lens 2 +



With Kodak Portra Lens 3 +

For extreme close-ups—Kodak Portra Lenses 1 +, 2 +, and 3 + for both still and movie cameras. Place one in front of your camera lens to step up its power for short-range photography of people, nature studies, and table-top subjects.

Kodak Portra Lenses are graduated in power, as their numbers indicate. To secure even stronger effects, the lenses may be used in combination. The pictures above show how you can "move in" with a Kodak Portra Lens. From \$2.65.

See the close-ups you can get with other inexpensive lens attachments

Doubles the scope of your camera—There's a Kodak Close-Up Attachment for most any Kodak or Brownie camera, or fixed-focus movie camera. It lets you shoot at closer than normal range. You get extra-big, sharp images of people, flowers, and small still-life objects. It's a simple, inexpensive way to enjoy a new experience in picture taking. All sizes \$1.63.



A Kodak Close-Up Attachment slips easily over most any camera lens, gives you pictures like one at right.

Use Kodak Filters for color films too

"Warm up" your color shots with a Kodak Skylight Filter—With this filter you get warmer-tone color pictures of subjects photographed in open shade and on overcast days. Use it, too, to reduce the bluish cast that often appears in distant mountain and marine scenes. And when you have occasion to take pictures of sunlit snow scenes, you'll find the Skylight Filter highly valuable. Prices from \$1.75.

Kodak Daylight Filter (No. 85) for Kodak Type A color films adapts these films for daylight exposures, and permits use of the same exposure settings as with Daylight Type Kodak color films. From \$1.75.

Kodak Light Balancing Filter 81C adds warmth to flash pictures taken with Class M Flash lamps (such as No. 5) when using Kodachrome Film, Type A, and reduces the bluishness that sometimes appears. From \$1.75.



(left)
Handy shade for lens—The Kodak Lens Hood is recommended when subjects are side-lighted or back-lighted. It tends to centralize the light and eliminate edge-flare in a picture. Can be fitted to most any camera. From \$1.75.

Summertime is snapshot time. Your Kodak dealer has anything and everything you'll need to make this summer's snapshots the kind you'll be proud to show. Always make him your headquarters for your photo needs.

Prices are subject to change without notice

Eastman Kodak Company, Rochester 4, N. Y.

Kodak
TRADE-MARK

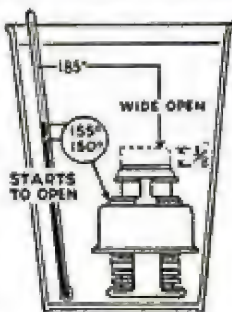


Care and Feeding of Engines

BY S. P. CORP

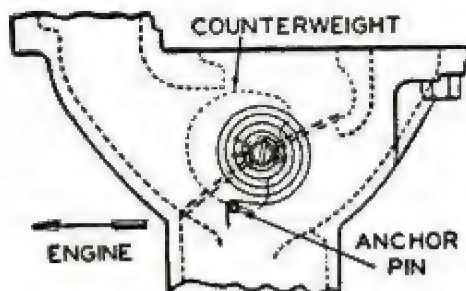
ENGINES REQUIRE HEAT

If you still have a winter thermostat in your engine, perhaps it should be replaced with a summer thermostat. In hot weather your engine should operate at 160°, but winter thermostats don't start to open until they reach 180°. Suspend your thermostat in a pail of water and heat water gradually until thermostat starts to open. At this point thermometer should read 150° to 155°. Valve should be wide open (5/16 inch off seat) at 180°. Winter thermostats open wide at 200°. This is too hot for summer driving. If yours is not wide open at 180°, replace it for hot weather.



MANIFOLD HEAT CONTROL VALVE

A spring thermostat in the exhaust manifold controls the valve that controls heat to the intake manifold. Check the operation by moving the counterweight with your hand, or watching counterweight as engine is accelerated. If it remains closed, intake manifold will be overheated, reducing your speed, causing sluggish operation or erratic speeds with a steady throttle. To correct this, use penetrating oil around the shaft, then work shaft until free.



ratic speeds with a steady throttle. To correct this, use penetrating oil around the shaft, then work shaft until free.

WATER DISTRIBUTING TUBE

If your car is two years old and has a water distributing tube, remove water pump and inspect tube. If it is plugged or rusted away, overheating may be caused.

FREE BOOKLET ON CAR CARE

"More Power, Less Gas, Less Oil," is an illustrated manual on care of your car—free on request. It tells all about Sealed Power KromeX Ring Sets and the MD-50 Steel Oil Ring, best for oil control even in badly tapered and out-of-round bores. It can save you a lot of money. Just address a postal card to Sealed Power Corp., Dept. G-7, Muskegon, Mich.



Clinic for Homemakers



As a service to our readers in solving the hundreds of problems pertaining to a home—inside or out—the editors of *Popular Mechanics* invite you to present your problems to The Clinic Editor for help and advice. Address your questions to The Clinic Editor, *Popular Mechanics Magazine*, 200 East Ontario Street, Chicago 11, Ill.

Applying Wood Filler

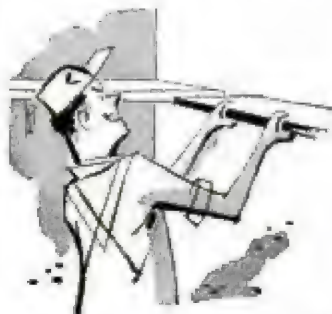
Q—I've always had trouble applying filler on grainy woods such as walnut and oak. I never end up with a smooth surface such as you see on professional work. When I wipe the filler across the grain as I'm directed there is very little of it left in the pores of the wood. Just how is it done?
C. R., Wis.



A—We think you are wiping the filler too soon. Wait until it stiffens (begins to set) and the surface appears flat, that is, without any sheen. The trick in successful application of a filler to open-grained woods begins with a proper mixing of the material to a consistency slightly heavier than thick cream. Mixing to the proper consistency takes time, but it pays to do a thorough job. After mixing, apply with a brush, spreading the material quickly and uniformly. At this point some finishers "strike off" the surface with a straightedge to remove the excess, which is returned to the container. However, unless the surface is perfectly flat, this step should be omitted as the excess material will be removed only from the high spots. Wait until the filler begins to set before wiping. This will require from 5 to 15 min., depending on the drying conditions at the time of application. Then rub lightly across the grain, using a piece of clean burlap if available. A good substitute is cheesecloth. If the filler shows a tendency to stick, apply a few drops of turpentine to the rubbing cloth. Continue rubbing across the grain until all the excess is removed, using a straight back-and-forth stroke. Don't rub hard as this removes the filler from the open grain. Allow to dry 24 to 48 hours, then sand lightly with the grain, and wipe off the dust remaining from the sanding operation.

Cornering Shelves

Q—I want to install shelves in the corner of a pantry, the shelves extending from the corner across the end of the room and part way along one side. Shelves will be about 8 in. wide and 60 and 72 in. long. How does one join the shelves in the corner?
H. T., W. Va.



A—We are assuming that you intend to support the shelves on conventional metal brackets. One method is to fit separate corner pieces, each one

(Continued to page 218)

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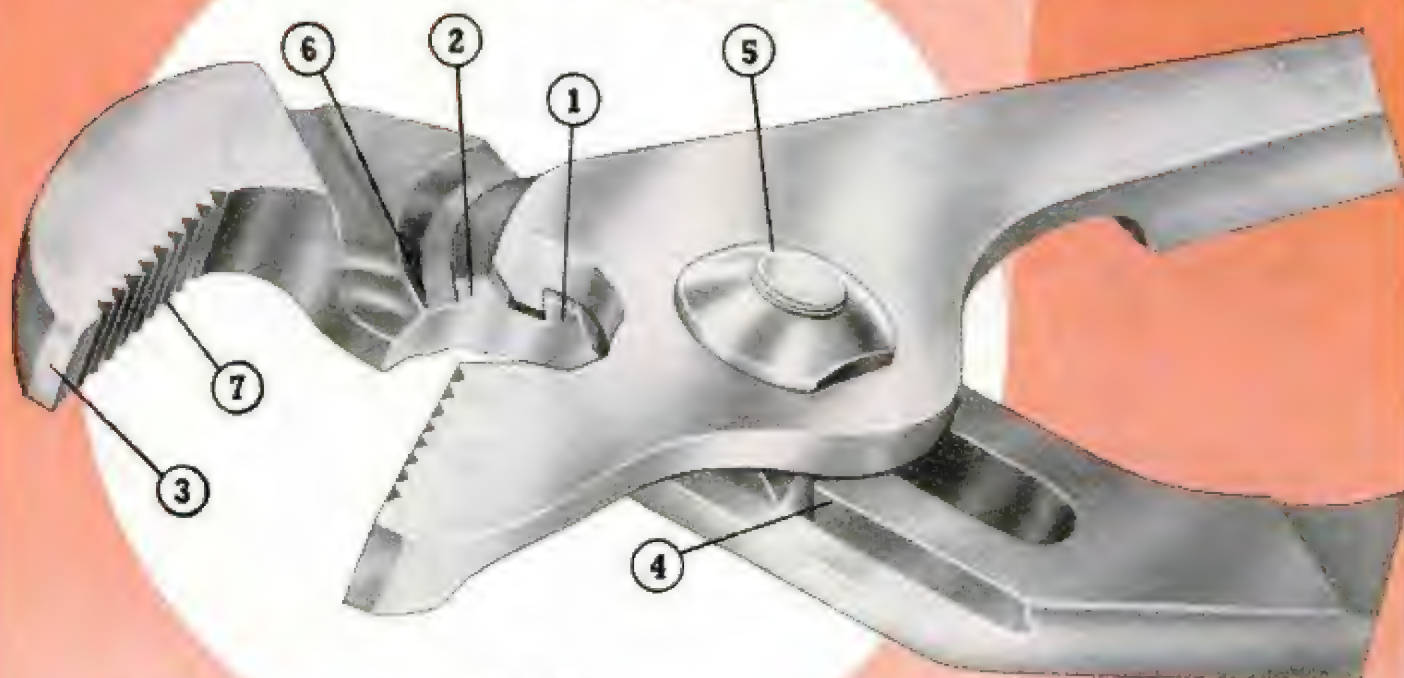
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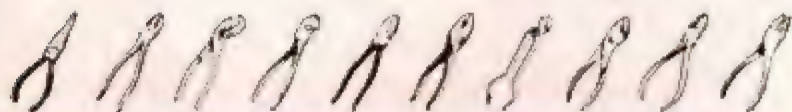
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(Continued from page 216)

having a radius in the outer corner with the length of the exposed edges 8 in. Then the 8-in. shelves are butt-joined to the corner pieces, either with dowels and glue or by means of flat-steel mending plates of the type sold in hardware stores. These already are drilled and countersunk for small screws. By this method each shelf consists of three pieces with two of the members joined to the corner piece. When placed in position, the individual shelves have rounded inside corners which makes a neat, attractive job. Another method involving less labor and time is to install the first shelf member full length across the end of the room. Then butt the other member at right angles and join with dowels and glue or with mending plates. In both cases it is assumed that the built-up shelf units will be supported on metal shelf brackets.

Plaster Cracks Across Ceiling



Q—Recently, after moving into a new home, I repaired a crack in the plastered ceiling extending diagonally from one corner to a point near the opposite wall. Within a short time the crack opened again, although it is not quite as wide as before. I used an ordinary crack filler. What should I do now to make a permanent repair?—G. B., Ind.

A—Your description makes it appear that the crack is caused by shrinkage of the framing. If this guess is correct, then there is some hope of making a permanent repair, as the wood will eventually stabilize at some point. Even though the crack may be unsightly, we'd leave it open for a time just to make sure that it doesn't open further immediately after making another repair. If it shows no sign of opening farther after a couple of months or so, then decide on the color of paint you wish to use on the ceiling. Mix a small quantity of this paint with sufficient whiting to make a fairly stiff putty and use this as a crack filler. Work the mixture into the crack with a putty knife, allow to dry, and then sand flush with the surface. Finish with an undercoater, or wall primer, and two coats of oil-base paint.

Tools Rust in Basement Shop

Q—I have trouble preventing rusting of my power tools and hand tools in my basement workshop. I don't think it's the moisture in the air as the basement is quite dry the year around. But if I handle the tools, especially those with bright surfaces, such as chisels, the saw table and a square or hammer, rust spots in the form of fingerprints show up in a day or so. Tools stored in drawers seem to rust even though I try to keep them coated with light oil. What can I do to prevent rusting of my tools?—B. G., Wash.

A—Perspiration on the palms of the hands and on the tips of the fingers is causing the rust spots and fingerprints on the tools. In handling them the light-oil film is rubbed off. Even though you reoil the metal surfaces after using, the salty residue of perspiration remains on the surface. To prevent rust from this source, the tools should be wiped thoroughly with a clean, dry cloth before reoiling. When tools are stored in the basement unused for some length of time it's a good precaution to coat all bright surfaces with a suitable rust preventive available in the liquid form. Apply with a cloth or as directed on the container. This material, which is of an oily consistency, forms a coating that resists removal by ordinary handling or even rubbing. It offers sure protection against rust on tools in storage. It is easily removed with a cloth and a few drops of turpentine. To protect smoothly ground surfaces such as machine tables, apply the rust preventive and then lay a sheet of oiled paper over the surface. This not only helps to protect from rust, but also keeps dirt and dust off the polished metal. Small hand tools, such as chisels, can be doubly protected during the summer months by coating with a rust preventive and then wrapping in a thin sheet plastic.

EXTRA WORK-SAVING FEATURES

Of These Tools Make It More Fun To Do It Yourself:

WIZARD HAND SAWS



TRUE DOUBLE TAPER
REDUCES WEIGHT, PREVENTS
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SPECIAL ANALYSIS
SAW STEEL FOR
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COMFORT-GRIP HARDWOOD
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UNIFORMLY HARDENED
BLADE - FROM GRIP
TO TIP - FOR EXTRA
LIFE.

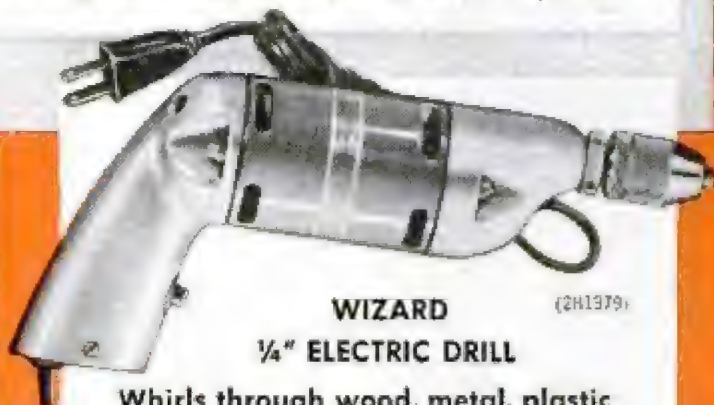
Slices through toughest wood with ease! Perfectly balanced —designed and workbench-tested by experts—to make sawing almost effortless, faster. Straight-backed 26" blade is properly heat treated, evenly hardened and precision tempered... no "soft spots" to reduce saw life. Stronger, yet lighter construction provides extra clearance, reduces friction. Next time, make it *really* easy work... see your Western Auto man for a Wizard Saw! 8 or 10-pt. crosscut, or 5½-pt. rip, only... **\$4.89**



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WIZARD 16 OZ. CLAW HAMMER

Perfectly balanced for a true, tireless swing. Wide, flat claw tips are specially tempered for extra strength... "V" beveled edges pull biggest nails or finest brads. Triple-wedged hardwood handle... **\$3.15**



(2H1379)

WIZARD ¼" ELECTRIC DRILL

Whirls through wood, metal, plastic... perfect speed-power balance. New instant on-off trigger. Oversize fan keeps motor running cool. Alloy steel-cut gears. Dozens of uses with just a few accessories... **\$12.48**

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NOTE: Western Auto Associate dealers own their stores and set their own prices, terms and conditions. Prices may vary due to differences in local conditions. If you do not know the location of your nearest Western Auto Store, write Western Auto Supply Co., 2107 Grand, K. C., Mo. (PM73)



Compactly grouped in an oval unit are, from top to bottom, the taillight, stop light and backup light

The Owners Report on the '53 Chevrolet

(Continued from page 112)

Highway through Santa Barbara. The mileage, including some off-road testing on back trails, was 660.

The car was equipped with power steering, and I must confess that initially I was prejudiced against it for light cars, but I

thoroughly enjoyed using this new Chevrolet feature. When the car is rolling, it almost steers itself. But, when more turning effort is required, Chevrolet power steering applies hydraulic pressure to the steering mechanism to do up to 80 percent of the work of turning the wheels. As you

(Continued to page 222)

In addition to a mail survey, Clymer makes personal interviews to learn how owners like their new cars



CLEAN YOUR CARBURETOR better, quicker, cheaper with GUMOUT

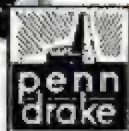
Why pay a lot of money to have your carburetor taken apart and cleaned? Clean it yourself with GUMOUT—right on the engine. Or, your favorite garage or service station can do the job for you with GUMOUT in only 20 minutes.

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Nickel plating resists
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UNBREAKABLE
Neoprene handle with
man-sized grip, mould-
ed to frame, high dielec-
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RUGGED
construction of
heavy-gauge steel.

TOUGH
Pin Posts are machined
from bar stock.

STRONG
Tension Screw, die
threaded from bar stock.

DESIGNED
to provide extra strength
at points of stress.

RIGID
construction assures per-
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Straighter cuts... less blade
breakage!

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Is the catalog number
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shake it on
every morning
then...



every step
of the day

QUINSANA FIGHTS ATHLETES FOOT INFECTION

QUINSANA works
full-time—and fast!
9 out of 10 report
amazing results.

91% of foot special-
ists interviewed used
it on their patients.
For burning, itching
feet—cracking, peel-
ing skin... get
QUINSANA quick!

Soothes, cools
tired feet!



1953 CHEVROLET SPECIFICATIONS

ENGINE

	Hand-Shift Models	Powerglide Models
Type	6-cyl. in-line OHV	6-cyl. in-line OHV
Bore and stroke	3-9/16x3-15/16 in.	3-9/16x3-15/16 in.
Piston displacement	235.5 cu. in.	235.5 cu. in.
Compression ratio	7.1 : 1	7.5 : 1
Brake horsepower	108 at 3600 r.p.m.	115 at 3600 r.p.m.
Piston material	Cast alloy iron	Cast alloy aluminum
Transmission	Conventional 3-speed unit standard on all models. Powerglide automatic unit (torque-converter type) with 115-hp. Blue Flame engine optional for Two-Ten and Bel Air series. Not optional in One-Fifty.	

GENERAL

All Models

Steering ratio (over-all)	23.1 : 1 (22.1 : 1 with power steering)
Steering wheel, lock to lock	4.53 turns
Turning diameter	37 ft. right 38 ft. left
Brakes	Conventional hydraulic; bonded linings
Tire size	6.70 x 15; 7.10 x 15 optional
Recommended pressure	24 lb. front and rear
Shipping weight (4-door sedan)	3250 lb. Bel Air with std. trans. 3365 lb. Bel Air with Powerglide
Wheelbase	115 in.
Tread, front	56-11/16 in.
Tread, rear	58 3/4 in.
Height, over-all (4-door)	63 3/4 in. unladen
Length, over-all (4-door)	195 1/2 in.
Width, over-all (4-door)	75 in.
Minimum road clearance	6-31/32 in.

INTERIOR DIMENSIONS (4-door sedan)

Front-seat width (hip room)	59.9 in.
Rear-seat width (hip room)	60.5 in.
Headroom, front	35.8 in.
Headroom, rear	35.1 in.
Legroom, front	42.7 in.
Legroom, rear	41.4 in.

CAPACITIES

Oil	5 qt.
Water	16 qt. (17 qt. with heater)
Gasoline	16 gal.

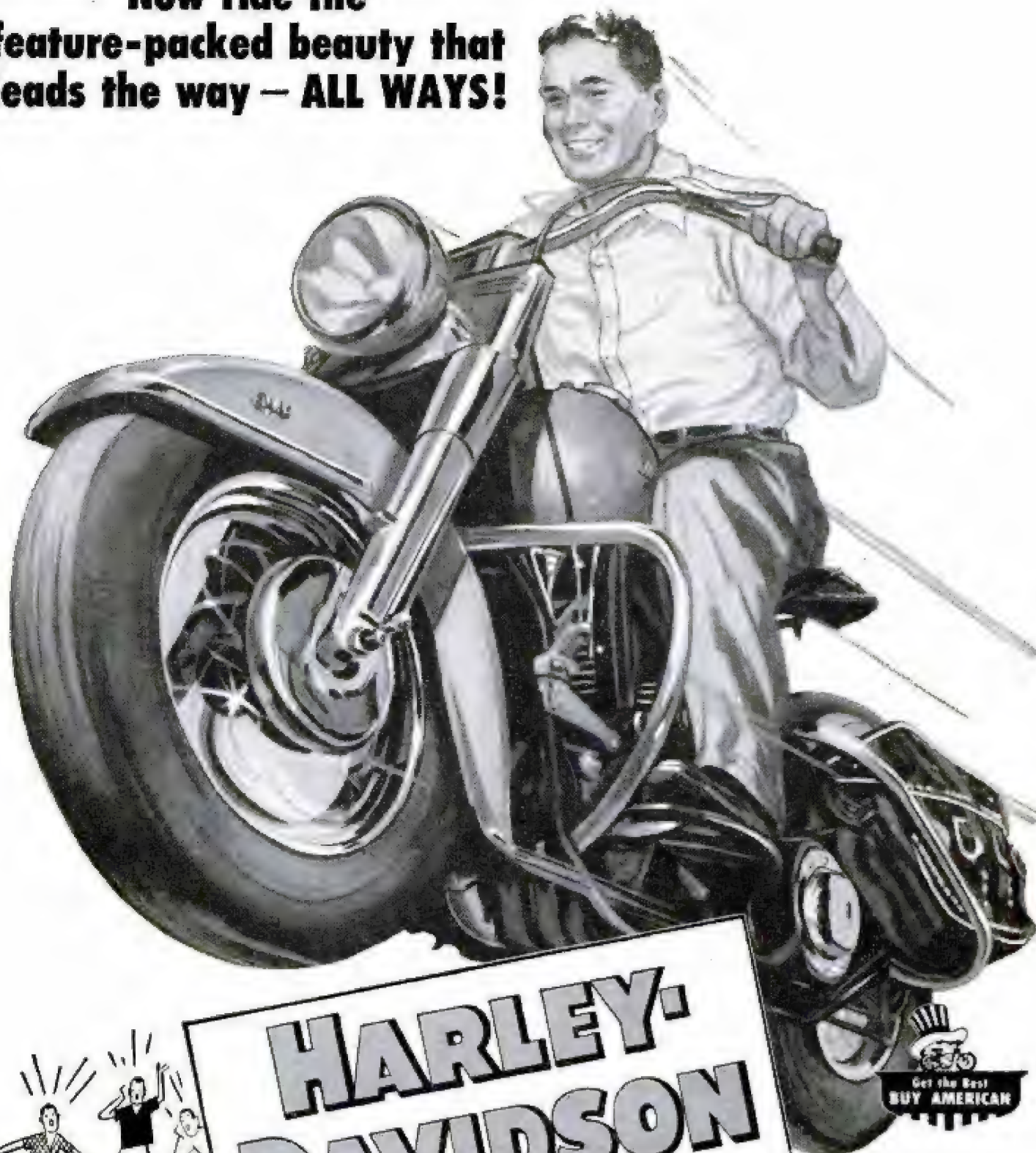
complete your turn, the pressure ceases and the steering wheel returns to straight ahead on your new course. The self-return feature is a good one that some makes of power steering do not have. The steering wheel with power steering requires 3 5/8 turns from lock to lock, which is good (4 1/2 turns without power steering.) The over-all steering ratio with power steering is 22.1:1 and without it, 23.1:1.

The 115-horsepower Blue Flame engine available in the Bel Air and Two-Ten models has cast-aluminum pistons which add power and lessen vibration in the 7.5:1 compression ratio, overhead-valve 235.5-cubic-inch engine. The One-Fifty series Thrift King engine still has cast-iron pistons, which I think are outmoded. It has 108 horsepower and a 7.1:1 compression ratio.

In speed tests on one of Southern California's table-smooth, rock-hard dry lake beds, the speedometer (fast by about 5

(Continued to page 250)

**Now ride the
feature-packed beauty that
leads the way — ALL WAYS!**



HARLEY- DAVIDSON

HYDRA-GLIDE®



IT'S a powerhouse on wheels . . . a beauty to look at, to handle, to own. It's built to rule the highways, with a 55 HP, 74 OHV engine . . . to take the byways in stride, with shock-absorbing action that smooths out the rough spots as no other motorcycle can. It's the Harley-Davidson Hydra-Glide, *the only*

motorcycle in its class! Go see this great performer at your dealer's today. Bring along a buddy. For literature and a copy of the **ENTHUSIAST** Magazine, filled with exciting action pictures and stories, send 10 cents to **HARLEY-DAVIDSON MOTOR COMPANY, Department P, Milwaukee 1, Wisconsin.**

QUESTION:

*What's the file
for this job?*



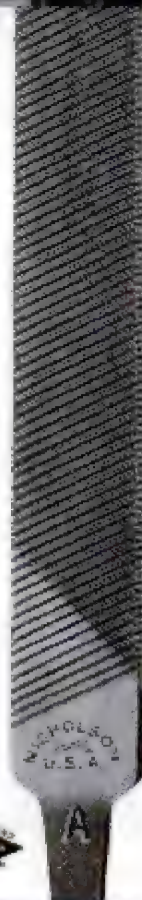
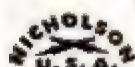
ANSWER:

• A Nicholson or Black Diamond Aluminum "Type A" File, because it is designed for use on aluminum and aluminum-alloy castings, bars, sheets. (Operation shown is removing "snag bruises" and smoothing the edges of an outboard motor's aluminum-alloy propeller.) Its special—and very accurate—tooth construction assures fast yet smooth cutting, breaks up ductile-metal filings to minimize clogging. Its uniform and long-lasting quality is something you'll find in ALL Nicholson and Black Diamond brand files. They make your amateur or professional workshop file rack something to be proud of. Sold through hardware stores and industrial supply houses.

NICHOLSON FILE COMPANY

23 Acorn St., Providence 1, R. I.

(In Canada, Port Hope, Ont.)



NICHOLSON
FILES FOR EVERY PURPOSE

Mountain Rescue and Survival

(Continued from page 120)

shelter on a high meadow between the rivers. The last four miles had been through deep snow; the night was clear and cold. As soon as the fire burned low an uncomfortable chill crept through the sleeping bags. The canteens of water froze solid. The cold night and equally frosty morning passed slowly.

The men prepared for the food drop by stamping out large letters in the snow: **FOOD**. The short rations and the exertion of the trip made them eager for the planes' appearance. At 1:30 p.m. the whole class looked at each other in disappointment. For the third time in a half hour the planes had passed over without spotting them. At one o'clock they had heard the first sound of the motors. Hurriedly they piled their signal fires with green branches but the smoke drifted low on the snow, wafted down the valley, and the plane passed them by. A second and a third time in the next half hour the air scouts missed them. Later they heard the faint roar of motors far to the east. Then all was quiet. Discouragement was real.

Suddenly there was another roar and a plane appeared again. Grabbing a small mirror, Gerry Dakan attempted a signal. Just before the plane disappeared again the mirror caught the reflection of the sun and the plane caught the light for an instant. The craft banked sharply to the right and dipped its wings. The class was exultant; that signal really meant food.

After the feast, the class hurried to reach the next camp by nightfall. The final 10-mile trek the following day was in a storm; the group had been fortunate in having had one clear day for the experimental food drop. They had seen no game, just elk tracks and a small owl that had been too wily to let them try out their snares.

Two more trips continued the study of survival. In one, we experimented with different dyes to color smoke so that it would be more visible from the air in a snow-covered area. As a final trip, two members of the class established a base on a ridge, and a search was made to locate them from the air. A ground party made up of the remaining members found them through information relayed by the Civil Air Patrol.

Though this is a new class at Olympic College, it already holds great promise. The students now realize the value of the experience and are eager to continue training. These are the same young men who, only two or three years ago, trembled as

(Continued to page 226)

MARVEL keeps

NEW CARS NEW LONGER...

USED CARS IN USE LONGER...

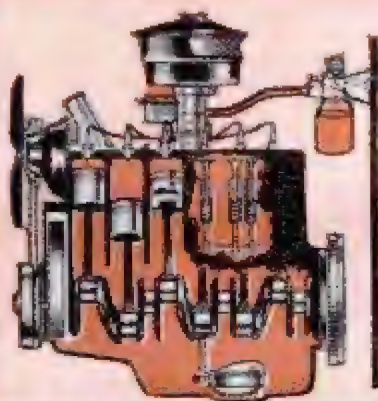


Drivers in the know . . . know Marvel is the finest lubricant you can put into your crankcase and gas tank.

And that goes for both new cars and used cars. Age doesn't matter. What does matter is the way Marvel registers in the lower service charges you shell out at inspection intervals.

Try a can of Marvel in your engine today. See if your car doesn't run better, longer . . . right from the start!

**MARVEL MYSTERY OIL—
THE MECHANIC'S CHOICE
FOR THIRTY YEARS**



Marvel in the crankcase lays a strong, heat-resistant film of oil on all moving parts . . . eliminates hydraulic valve clatter . . . provides ring seal . . . cleans, cools and protects bearings and vital upper cylinder regions. The car runs for many more engine miles per dollar.

Install a Marvel Inverse Oiler for direct lubrication to the heart of the engine. Feeds in direct proportion to horsepower curve through inverse ratio to manifold vacuum. No other oiler works on this principle! Fully adjustable. Easy to install. Fully guaranteed.

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Motorola Car Radio

ONLY \$ **39⁹⁵**

Imagine a powerful, magnificently toned radio like this at such an unbelievably low price! High fidelity, superior tone, extra range and power. Patented motor noise filter, automatic volume control, big speaker and control head adaptable to instrument panel. So easy to install, it can be put in your car while you wait.

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Better See **Motorola** *Golden Voice of* Radio

they started their first lessons in climbing at Monitor Rock, a manmade 24-foot practice mountain located in a recreational city park in Seattle, Wash. Later the students enjoyed ice and glacier practice on Mount Ranier and Mount Olympus. The following year, in the advanced class, they felt the thrill of more experienced mountaineers as they scaled the vertical rock walls of Cruiser, a difficult rock pinnacle in the Sawtooth Range.

For these men, climbing has taken on an even broader scope, but to Olympic College, it is another step toward making climbing safe. Safety rules have become a part of the climbing code, and are important to all those who enjoy climbing. Here is a basic set of such rules:

1. No climbing party should number less than three.
2. A prospective trip must be registered in detail with the official in charge of the area.
3. Strenuous climbing trips should be restricted to summer and early fall; special care is needed in summer snow and ice.
4. Crossing glaciers necessitates the roping of each member of the party.
5. Proper equipment, strong climbing shoes and warm clothing must be taken.
6. Emergency food for at least two days beyond the length of the projected trip must be included.
7. The climber must not overestimate his experience and physical ability.
8. Climbers must turn back while they still have the time and strength to reach camp safely. In acting rashly, the leader endangers not only his own life and those of his party, but also the lives of those who come to their rescue.
9. The climber must be extremely careful on all climbs, even the easy ones.
10. The value of experience must not be overlooked. It takes many years to become a good climber. ★ ★ ★

Blast from A-Bomb Rises 50 Miles

Blast waves from an atom bomb which rise as high as 50 miles into the sky sometimes throw the blast back onto the ground as far as 600 miles away, research with the Nevada explosions has shown. As the waves rise, they may encounter layers of warm air 1000 to 2000 feet above the ground. Some of the blast waves go through, but others bounce back and hit a focal point on the ground. The same sort of action can occur when the blast waves get to the troposphere, six miles above the ground, the ozonosphere, 25 to 40 miles up, and the ionosphere, some 50 miles up.

**YOU, TOO,
CAN ENJOY
LIGHT-
HEARTED
LIVING**

*in a
MOBILE
APARTMENT
HOME*

WE FOUND NEW LIVING
FREEDOM AT NEW
LOW COST, IN OUR
NEW MOON,
AND, TOO,
THE WHOLE
FAMILY LOVES
IT.

NOW I MOVE TO TOP
PAYING JOBS AND TAKE
MY FAMILY WITH ME.
WE ENJOY TRAVEL AND
VACATION FUN - ALL IN
OUR **NEW MOON**
HOME THAT WE TAKE
WITH US WHEREVER
WE GO. WE TURNED
WORTHLESS RENT
RECEIPTS INTO REAL
HOME OWNERSHIP.

COMPLETELY FURNISHED — READY TO LIVE IN — AT NEW LOW COST



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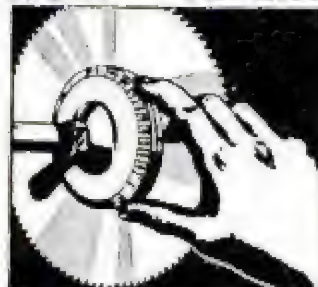
Gleaming streamlined exteriors sheath a world of living comfort that is completely furnished and ready to set-up housekeeping. Modern all-steel kitchens feature built-in cabinets, sink refrigerator and range. Automatic heating system, with scientific insulation, assures warmer winters and cooler summers. America's finest mobile home, every New Moon includes everything for **BETTER LIVING** — for housing, travel and vacation fun.

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REDMAN TRAILER CO., ALMA 40, MICH.



NOW—40 different CUTS with AMAZING, NEW *Warren*



DADO SAWING WASHERS On Your Saw Blade

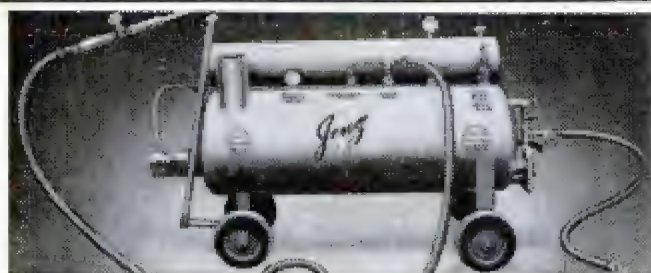
Just dial widths to cut parallel grooves perfectly smooth. No warp, vibration

or trick screws. Strengthens blade, perfect balance. **GUARANTEED!** At your dealer's or order direct. Give arbor size— $\frac{1}{2}$ ", $\frac{3}{8}$ ", $\frac{3}{4}$ ", 1".

Send for free booklet

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Dept. 27, Box 98 North End Station, Detroit, Mich.

**ONLY
\$4.95
PER
SET**



EARN \$6.00 PER HOUR

In a depression-proof business with the **NEW JENZ SUPER CHIEF STEAM CLEANER**. Portable—No moving parts—Cleans anything—Any place—Motors—Chassis—Machinery—Floors—Buildings—Oil Rigs, etc.—Oil fired—Economical—Fully tested and warranted. 75 lbs. steam in ten min.—Model 90, Complete as illustrated.... **\$463.50**

F.O.B. shipping point

HI-PURE LABORATORIES, Evansville, Ind.

**SURE WISH
I HAD MY YELLOW FLASH
NOW!**

SEE what you're doing—
Where you're going—

with **JUSTRITE YELLOW FLASH 8**—World's most dependable flashlight—power packed with 8 cells— $\frac{1}{2}$ mile of brilliant light at your finger tips. Compact, tough, handsome. Combines exclusive adjustable head, handy square shape. (Can also use with lantern battery). A light, bright value, only **\$3.95** (less batt.)

JUSTRITE Red Four-Battery Warning Flasher prevents road accidents. Visible half-a-mile. Converts to steady, white light.

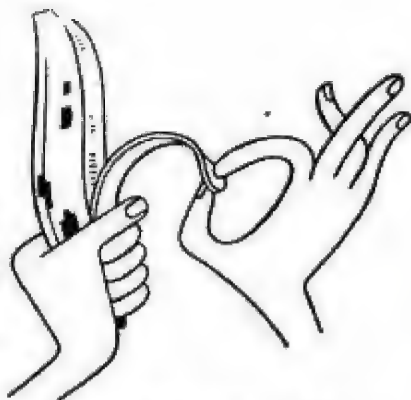
Rugged, dependable, rustproof.
Only **14.95** (less batt.)

At hardware, sporting goods, department, auto accessory stores — everywhere!



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peeling a
banana!



Klean-Strip peels off paint

and all other finishes!



Non-inflammable • No after wash

It's clean and safe! Buy it
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Congress Pulleys

Standard equip-
ment on leading
home appliances —
clothes dryers,
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YOU PAY NO MORE for CONGRESS QUALITY

Congress quality costs no more! Insist on the
drive preferred by most original equipment
manufacturers. There is a difference! Congress
Drives are electrolytically plated, diamond-
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Buy Congress V-Belts and Pulleys from your
local supplier.



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TANN CORPORATION
World's Largest Manufacturer of FHP Pulleys
DETROIT 34, MICHIGAN



Reinforcing Corner Mesh Snaps Into Position

Snapping into shape after it's cut and
applied, a wire mesh designed for use un-
der plaster reinforces corners and joints.
The mesh, available in four, five and six-
inch widths, can be cut to necessary length
with ordinary snips, bent back with the
hands, and when applied to the corner it
automatically snaps into place by itself.
The mesh is made with a smooth selvage
that will not tear hands or clothing.

Propeller-Driven Tricycle

Eliminating pedal-pushing, Malcolm
Reece of Southampton, England, built a
propeller-driven tricycle that goes 30 miles
per hour. The miniature airplane propeller
is powered by a small engine.



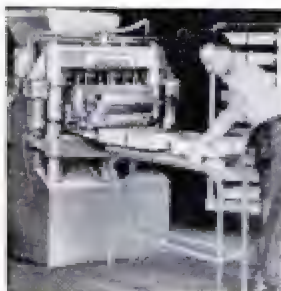
BRIKCRETE



Local Manufacturers Have Broad Opportunities

Brikrete manufacturers operate compact, self-contained plants under franchise privileges in protected territories. Each is an independently owned unit in a country-wide chain, using local materials and local labor to supply the world's most modern masonry for local building needs.

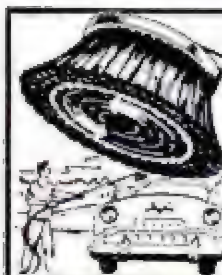
Brikrete is rich in sales appeal because it is ahead in design, style, size, color, economy. Easily the preferred masonry. But because local production eliminates economic wastefulness, Brikrete can be sold at a lower-than-lumber price. Yet still allow a generous profit margin.



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New WHIRL-A-WAY JET-PROPELLED Car Washer

Waterpower makes this brush WHIRL, just like it makes dynamos go 'round! Thick, long bristles of finest horsehair whirl away dirt, dust, road haze; 4-ft. aluminum handle has built-in regulator and shut-off. Pays for itself over and over.

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NEW SAW SHARPENER

Improved #64 Hand Gummer sharpens all types circular saws 4" to 20" diam. Ideal for saw shops. Self-Centering adjustment for quick, easy set-ups. Complete with 1/4 HP motor, 1 grinding wheel & cord, \$79.50 FOB Portland. Wt. 70#. SEND FOR FREE LITERATURE.

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Approved by Underwriters' Laboratories for outdoor use



**IDEAL FOR
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OUTBOARD MOTORS**

SAFE—Automatic shut-off valve in end of spout prevents spilling or splashing—eliminating fire hazard.

EFFICIENT—Gasoline flows by gravity through brass "swing-around" spout when crossbar of valve is pressed against tank opening.

#171 1/4—1 1/4 gal. cap. Retail price \$5.00 each

#172 1/2—2 1/2 gal. cap. Retail price \$6.00 each

Buy one at your sportshop, marine or hardware dealer's.

EAGLE MANUFACTURING CO. WELLSBURG W. VIRGINIA

IT TAKES 2 HOLES TO MAKE A PUNCTURE



● Anything that punctures your tube must go *through* your casing. You have the tube repaired, but what do you do about the **FIRST** hole . . . the one in the casing? Never neglect it!

Punctures in casings—even small ones—suck up dirt and moisture, cause rot, result in blowouts, waste thousands of tire miles. To make tire mileage stretch, it's important to get all the tire service you can. It takes **TWO** holes to make a puncture . . . always have **BOTH** repaired.

**DRIVE IN
WHERE YOU SEE
THIS EMBLEM**

BOWES



Your Bowes "Seal Fast" dealer has the finest tire repair materials . . . equipment . . . and "know how." Take your tire troubles to him. He will inspect your tires thoroughly *inside and out*. When he finds trouble he will fix it and give you many added tire miles . . . and **SAFETY**. For safe tire service, look for the Bowes Emblem.

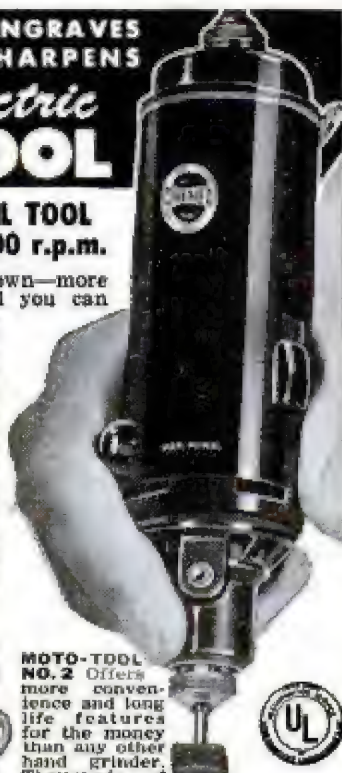
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GRINDS • CARVES • ENGRAVES
DRILLS • ROUTS • SHARPENS

DREMEL *Electric* MOTO-TOOL

**FASTEST MOST POWERFUL TOOL
in its class—Approx. 27,000 r.p.m.**

Most practical tool a man can own—more powerful than any similar tool you can buy. THE ORIGINAL POCKET-SIZE MACHINE SHOP. A jack of all trades around the workshop, it is indispensable for carving, drilling, grinding, and for sharpening tools, scissors, kitchen knives, garden tools, lawn mower blades, etc. More versatile than a 1/4" electric drill as it is so light weight (13 oz.) and handy for so many small jobs. Perfect for drilling small holes to hang pictures, installing cabinet hardware, hardwood trim. Powerful, 110 V. A.C.-D.C. motor. A tool built for years of lasting service.



MOTO-TOOL NO. 2 Offers more convenience and long life features for the money than any other hand grinder. Thousands of satisfied users.



Moto-Tool No. 2 (with 1 emery wheel point)..... **\$16.50**
KIT NO. 2 Includes Model 2 Moto-Tool and 23 Accessories (High-Speed Steel Cutters, Grinding Wheels, Polishers). Packed in sturdy hardwood case.... **\$23.50**

A PRECISION TOOL WIDELY USED IN INDUSTRY



For Sharpening Tools



Speeds Up Repair Jobs



Great for Hobbyists

SEE YOUR DEALER! If he can't supply, order direct on five-day trial, money-back guarantee. Remit in full for postpd. shipment; or, send \$2 now, pay postman balance plus postage and C.O.D.

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ABSORB DAMPNESS!

In Basements, Closets, etc.

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**SOLVAY
AIR-DRYETTE, JR.**
and SOLVAY
CALCIUM CHLORIDE

Absorbs moisture — the cause of rust, warping, mildew in workshops, darkrooms, closets, playrooms, storage rooms, vaults. Built to last for years. Big capacity. Works fast, absorbs up to 3 1/2 qts. per day. Compact, inexpensive, clean, safe, odorless. Thousands in use. Write for booklet and name of your nearest dealer. Not available on Pacific Coast.
Dept. 89-7, SOLVAY PROCESS DIVISION
Allied Chemical & Dye Corporation
61 Broadway, N. Y. 6, N. Y.



Daredevils Walk the "Big Top" Wires

(Continued from page 77)

no obstacle. The wire is all they see, anyway. Bersonini, Josephine's father, once crossed a crevasse hundreds of feet deep on a wire. He was in the Austrian army at the time. Food supplies were being shunted over the chasm in an iron basket hung from a cable. En route the basket jammed. Bersonini wrapped his feet in gunny sacks and with a sapling for a balancing pole, walked the cable, 200 feet, to the basket, unloosed it and returned.

Acts said to be the most frightening the world has seen were performed four years ago by three German youths—Jupp Klein, Siegwart Bach and Rudi Bohme. Their cable was 3000 feet high—from one mountain buttress to another, on the Austrian-Bavarian frontier. While Bach stood on his head on the handle bar of his motorcycle, Klein hung by his knees from a ladder suspended from the machine and held in horizontal position by Bohme, who stood on the opposite end of the ladder.

Wire walkers know they are bound to have falls, and practice what to do in every conceivable emergency. Said Colleano: "We break falls by going into somersaults, handsprings and glides. But if a foot slips, it means a bad spill, for the wire reacts so fast it is impossible to make a recovery. It is the wire itself that I dread. It cuts like a saber and the bounding-tight has force enough to break every bone in your body."

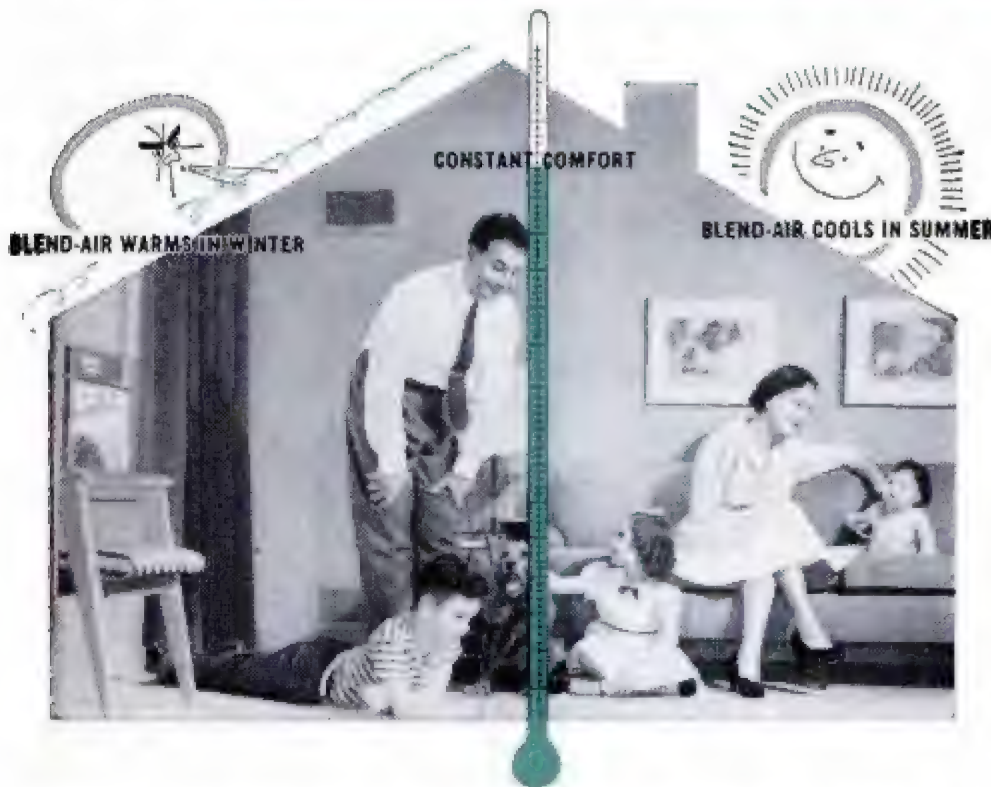
High-wire acrobats do not often fall, but danger is ever present. One time, as the Wallendahs prepared for their act, a cable sagged, causing them to topple. Herman caught the wire with one hand and one foot, and grabbed Helen with his free arm. Carl, knocked from his falling chair, also caught the cable. Joseph was thrown flat on the wire but kept his balance. Thus they hung until a lifesaving net was thrust under them.

Once when Alzana was watching his act, he saw that Hilda and Harold, riding two-high on a bicycle, were off balance. He rushed beneath them in time to break the impact as they came hurtling down. The trio collapsed in a heap, all performers seriously injured.

Veteran performers accept the tragedy along with the glamour. It is all just a part of their lives and as always, the show must go on. ★ ★ ★

Hummingbirds have such a high metabolic rate that they hibernate every night, their metabolism dropping to 1/15 of the daytime level; if they didn't, they would starve to death in their sleep.

Never before...air conditioning like this *new* Coleman Blend-Air Conditioning!



YEAR-ROUND BLEND-AIR CONDITIONING KEEPS YOUR HOME COOL ALL SUMMER, WARM ALL WINTER

To make every room in your home more comfortable all year long, Coleman now adds a cooling and dehumidifying unit to its famous Blend-Air Heating System.

This new combination system — Blend-Air Conditioning — uses the same revolutionary air-blending principles as Blend-Air Heating. It keeps you more comfortable than ordinary air conditioners because it squeezes twice as much moisture from the air. This makes the air cool and crisp—not cold and damp. Continuous circulation, perfect “perimeter” heating and cooling.

In winter, this new system floods your home with constantly circulating warm air that eliminates cold floors and provides uniform comfort. Mail the coupon for details. The Coleman Co., Inc., Wichita, Kansas.

Keeps comfort constant

Exclusive Magic Blenders increase air circulation, improve comfort, reduce floor-to-ceiling temperature difference.

Squeezes twice as much

moisture from summer air, reducing humidity that much more. Air is cool, crisp, dry—not cold and clammy.

Cuts water costs 97%

Exclusive Water Saver uses cooling water again and again, not just once. You save 97% on water costs. No cooling towers are needed.

Spreads total cost

Get heating now, cooling later. Both systems use same small air tubes, same Blenders. A big money-saver in any home.

Saves space

Put it in closet, utility room, basement. Or split up components, with compressor outside if desired.

Installs easily

in new and old homes. Small (3½") air tubes, prefabricated and delivered ready to install, fit in standard walls.

THE MAGIC BLENDER DOES IT!



In winter, the Magic Blender blends room air with freshly heated air to maintain constant comfort. In summer, the Magic Blender blends room air with cool air from the cooling unit for refreshing coolness. The Blender keeps air circulating for year-round health and comfort.

ALL MODELS AGA APPROVED OR LISTED WITH UNDERWRITERS' LABORATORIES

HEATERS · WALL FURNACES · FLOOR FURNACES · WATER HEATERS

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Coleman it isn't Blend-Air"

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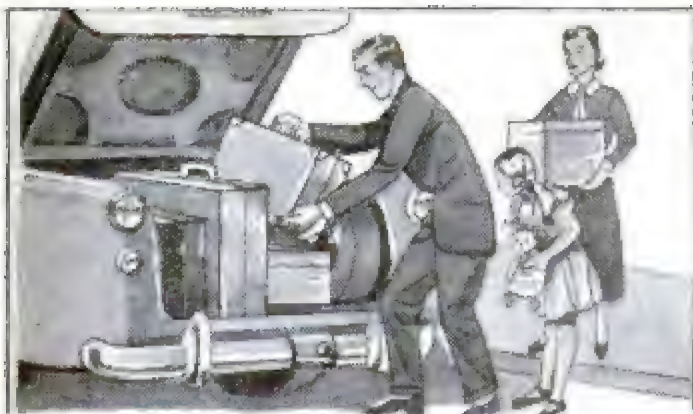
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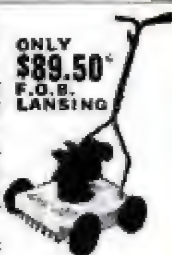
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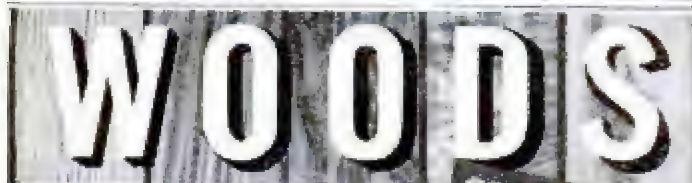
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Mysterious Death Their Business

(Continued from page 69)

groove—and the one that came from the gun which the boy had admittedly carried was the one that fitted the groove! Larger ammunition from the girl's gun didn't fit at all. Confronted with this fact, the boy confessed.

What a man trained in legal medicine can do with bones is sometimes unbelievable. By looking for certain growth clues on many bones in a skeleton, or by careful examination of teeth, he can determine pretty closely the age of the victim. A skull or pelvis may be all he needs to nail down the sex. And by referring to comparison tables (of size and conformation) he can often determine sex from only an arm or leg bone. Other tables allow him to reconstruct the actual height of a victim from just one long bone.

He may even build out simulated flesh, in clay, on an old skull and come up with a remarkably close reproduction of what the dead person looked like. Certain bone characteristics may reveal racial facts about a skeleton, and any number of minute malformations may point to its actual identity. The skull of a woman, with malformation of one side, was found recently. It also had a broken hyoid bone—which usually is snapped only in manual strangulation. With this to go on, investigators found that a woman with a face larger on one side than the other had disappeared from the neighborhood some years back. Her husband was found and confessed that he had throttled her.

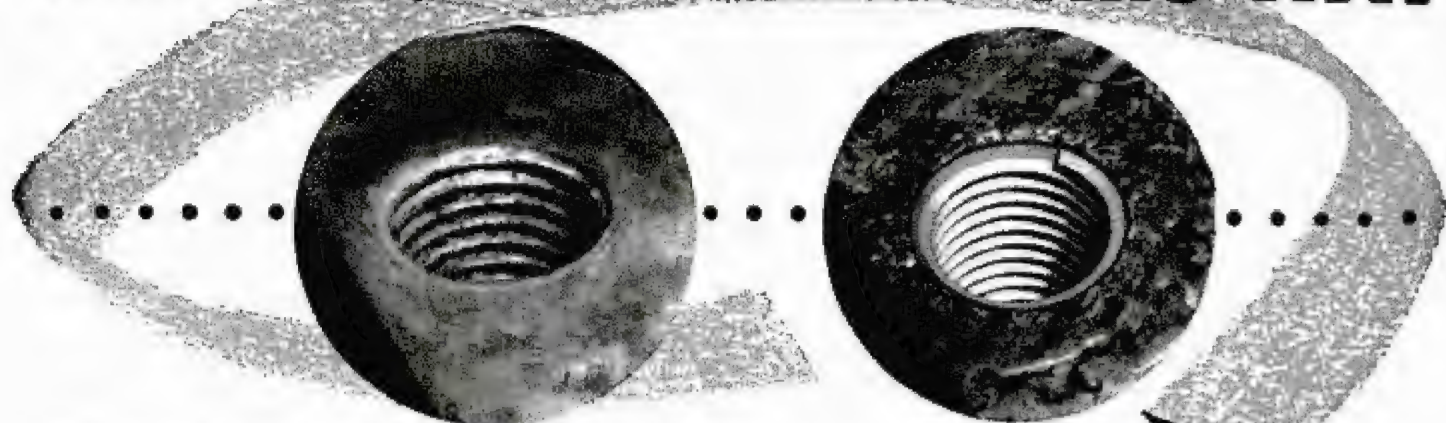
Just how far good lab work can go in solving a complete mystery is probably best illustrated by a case Doctor Ford and Glass both tell about, because it required so many phases of real scientific digging. Early one fall, a skeleton wearing remnants of female clothing was found in a remote blueberry patch. A weathered rope was tied around the wrists and neck. By X ray and precise bone measurement, legal-medicine men determined that it was a teen-aged girl, about five feet tall. Her clothing size, found on a mildewed label, indicated her weight. Textile experts determined the quality of the clothing and her status was determined as middle class.

When this information was publicized in the papers, the girl's parents came forward and identified the remains. But there was lots more to find out. How was she killed? Lab experts took the rope that had bound her and traced the makers. From them they got a similar piece and tested it for shrinkage to see if the original rope, when

(Continued to page 236)

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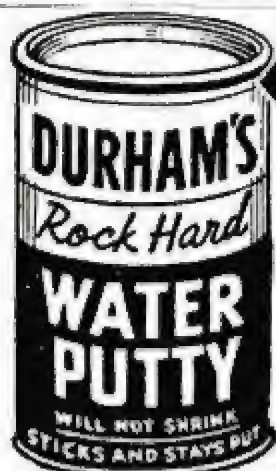
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new, had been the right length to cause strangulation when tied in the same manner, on a body of the same proportions as the victim's. It was.

To learn when the crime had occurred, entomologists, botanists and meteorologists were called in. The botanists carefully gathered up bits of crushed blueberry bushes that had lain under the body. Studying them in the lab, the found evidence of arrested leaf buds, but no berries, and thus deduced that the body had fallen early the previous spring. This was borne out by the entomologists who studied samples of soil from beneath the remains under lab conditions. They found crushed carrion-beetle larvae—insects which reach that stage of development at that time of year. Meteorologists agreed that everything found was consistent with the weather record for the previous spring.

Police took up the hunt from there, and within 10 days they arrested a young man who confessed the crime, corroborating the evidence in nearly every detail. The murder had been the result of a love affair.

There's a good reason for those plaster models in the legal-medicine lab. Often, if they know the distance at which a gun was fired, experts can determine whether the wound was self-inflicted or otherwise. The models show the type of wound and powder pattern made by different types of firearms at varying distances. Students who study them retain a vivid impression that they will carry with them on examining jobs, and will know what type of wound they're looking at.

Here's how it works: A woman came to the lab one day and said an insurance company refused to pay double indemnity on a policy because evidence of her husband's recent death in a hunting accident pointed to suicide. His gun lay beside him and a shot had penetrated his lower chest through his hunting jacket.

Experts photographed the man's perforated jacket, then got an identical piece of cloth and fired the same type charge through it from distances varying from contact to 20 inches. The pattern made by the charge at distances between 16 and 20 inches matched the hole and powder-residue pattern on the jacket. Not even a contortionist, it developed, could have held the muzzle of that gun at such a distance and pulled the trigger. Further examination of the scene showed evidence that the man had been climbing the fence, gun in hand with a safety catch off (a cardinal breach of hunting safety rules). The trigger snagged a branch, and *bang!* The insurance company paid off.

(Continued to page 238)

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One careless examiner folded a blood-stained sheet while it was still wet. The blots and smudges forever destroyed the shape of the original stain—which might have told a trained man the direction in which the blood had spilled, providing a clue to the cause of death. Another time, a bloodstained scrap of cloth was dried on a stove by the examiner, to preserve it. Instead, he destroyed any number of possible chemical clues that it might have yielded, since heat changes the chemical composition of blood so thoroughly it can't even be typed.

Many a detail has helped solve mysterious death. A killer was exposed because he kicked the victim in the nose after the crime. Painsstaking examiners noticed nearly invisible bits of foreign matter embedded in the dead man's skin. When removed with tweezers and examined under a microscope they proved to be particles of shoe leather. The suspect's shoes were then examined. Sure enough, the lab experts discovered traces of skin—and the leather in those shoes matched the particles found on the corpse.

Importance of such details are the reason for those incredible dioramas at the Department of Legal Medicine. Men who attend these seminars held at Harvard each year spend the last part of their course solving the mysteries in the glass cases. Each is a composite of several actual crimes. Called "Nutshell Studies of Unexplained Death," the models were made in a huge farmhouse workshop on the estate of Mrs. Lee, in Littleton, N. H. She and a skilled carpenter, working together in spare moments with an assortment of dental tools and jeweler's equipment, can turn out three of them a year.

A member of the International Association of Chiefs of Police, and a state-police captain in New Hampshire, this remarkable woman has gone to unbelievable lengths to achieve miniature realism in each scene. A significant red mousetrap in one farmhouse set is half an inch in diameter, with six tiny holes around the side. From one of them the rear end of a mouse protrudes—made of a bit of pussy willow, with a threadlike tail. Mrs. Lee herself knitted the socks of her six-inch figures, on needles the size of an ordinary straight pin. A carpet sweeper has a four-inch han-

(Continued to page 240)



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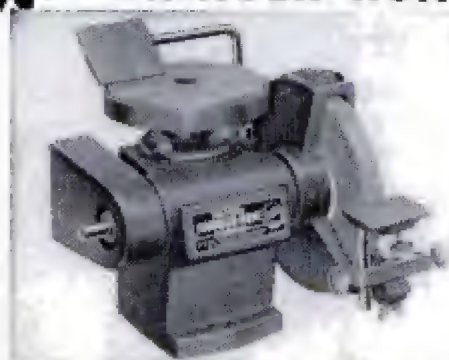
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dle and a base no bigger than a packet of book matches.

In another scene, a five-inch-tall state trooper wears a whistle around his neck that you could blow if you could get your lips on it. The pencil in his hand, made from one end of a toothpick, has lead in it! Houses and buildings are constructed to scale in every detail—including studs, plaster lath, beams and all. Even a bullet hole in a miniature screen door is to scale.

There is actually no limit to the perfection Captain Lee insists upon achieving in these exhibits. She ages and weathers materials for weeks so they will be faded enough to look real. A fine piece of old linen was discarded for drapery material because it wouldn't hang limp enough to achieve the proper scale of drape.

Her ingenious imagination converts all sorts of things to use in the models. "Benzedrine inhalers," she says, "with a little red paint and remodeling make excellent fire hydrants for a city street." Tiny newspapers are made by reducing real ones photographically, making plates, printing them, then stitching top and bottom edges so they can be torn to simulate saw-toothed edges of real ones.

Special techniques are used to make her human figures. Antique German bisque dolls, with head and bust in one piece and movable bisque arms which must be drilled with diamond dust form the working base of every one. She makes bodies of cloth, stuffed with soft cotton and a core of BB shot—so they'll be flexible but not so light they'll sprawl awkwardly and uncorpse-like. Feet and legs are of carved wood.

Each corpse is cunningly colored. One may carry the cherry red brought on by carbon-monoxide death; another an ordinary post-mortem purplish caste. The delicate miniature discoloration in bruises on the $\frac{1}{4}$ -inch neck of a throttled victim are so accurate that a trained examiner can diagnose it immediately.

And that's the whole idea of these models. Each is loaded with important clues for a man who is observant and knows his legal medicine. In one diorama, a vital clue can only be found by looking in a miniature mirror. In another, there are 31 major blunders and a lot of minor ones committed by a bumbling policeman before the arrival of a medical examiner. Students must find them all.

If a man can spot all the clues in Captain Lee's nutshell mysteries, it's a pretty sure thing that Harvard's Department of Legal Medicine has turned out another member of a growing army that, they hope, will put a final period at the end of our "unexplained death" list. ★ ★ ★

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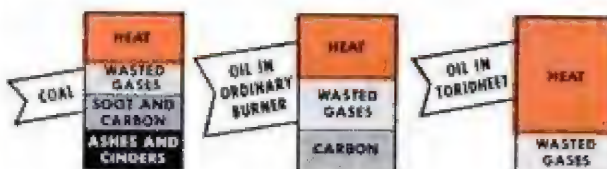
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SAWS COSTING 3 or
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Saws 2x4's in 1 Cut

Toss away that old-
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Don't put in hard-work-
ing hours to do a simple
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minutes.

"ARCO-SAW," the only geared
saw attachment in which three
2x4's in one cut, does the work
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In seconds it is attached to any 1/4" drill. All
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Worm Drive Clamp & Strong Safety-Yoke

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build anything from a bookcase to a bungalow!

You get straight, square cuts or any depth cut up to 1 3/4" by a
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Included is the sensational fast-cutting 5-inch SAFECUT Blade
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REPLACEMENT BLADES: Specify 5" Safecut, \$1.75
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Say You Saw It in Popular Mechanics



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Colorcreting is a fascinating
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Requires no previous experience or
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Here We Go on Our . . . Million-Dollars-a-Mile Toll Roads

(Continued from page 88)

heaters, but the cost would be staggering
(\$15,000 per hour per mile). Instead they
have set up special systems of signal lights
at danger points along the route. Neon
signs flash notices of slower speeds when
needed, and indicate the type of trouble.

Revolutionary designs are being con-
sidered for some newer pikes. One recom-
mendation for Ohio's superhighway is a
plan to reverse the traffic flow, so that east-
bound lanes would be on the north side of
the median, westbound on the south side.
This would put the high-speed traffic on the
outside lanes of the road. The inner lanes
would be the slower ones. Boosters of the
plan point out that all service stations,
maintenance shops and restaurants could
be in the 40-foot median strip with access
lanes to both sides. Motorists going in either
direction could swing off without crossing
opposing traffic. Interchanges would be
simplified, since all traffic could funnel out
via one simple system between the oppos-
ing lanes, instead of a spreading clover-
leaf pattern demanding multiple under-
passes and bridges. While opposition to
the plan may kill it, the idea proves that
engineers are considering drastic changes
in road design.

Nearly all the new superhighways sport
unique structures to help carry them over
rough spots. Motorists zooming along the
New York Thruway will "ride on air" for
three miles when they whisk across the
huge \$50,000,000 bridge, built by Merritt,
Chapman and Scott Company, which spans
the Hudson River's Tappan Zee between
Tarrytown and Nyack. Much of the bridge's
support will come from huge concrete cais-
sons, built like the watertight compart-
ments of a ship. The caissons will be sunk
with sand and water ballast, the super-
structure built on top of them, and then
ballast removed until proper buoyancy is
achieved. The stunt was necessary because
the Hudson's bedrock gorge is too deep at
this point to make ordinary piers practical.

Another unique affair is the Coleman
Memorial Bridge at Yorktown, Va., carry-
ing U. S. Route 17 to expressway connec-
tions in the north. The bridge has two
center sections—each balanced on a caisson
—that swing around like subway turnstiles.
Called a "double swing span," the sections
open wide enough to clear a 450-foot chan-
nel for the biggest battleships afloat.

Interstate superhighways are fine, but
Bureau of Public Roads officials point out
that the great toll highways are not solving

(Continued to page 244)

Don Juan



Here's Why IT'S SO PRACTICAL!

- Has only 2 moving parts
- No hidden springs • Hygienic
- Perspiration Proof • Non-Corrosive
- Non-Magnetic • Conforms to the wrist — most comfortable to wear
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RESILIENT STAINLESS STEEL

Service Model

Contour CLASP-ON WATCH BAND FOR MEN

WRIST SIZES
Small 6 1/4" — Medium 6 3/4" — Large 7"

At your jeweler or write direct illustrated brochure on request

No. 1 Stainless Steel adjustable Plain Clips \$3.95

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MAGNETS 225 lb. PULL

GENUINE ALNICO—NEVER WEAKENS

AMAZING, PERMANENT MAGNETS—WILL NOT WEAKEN! NON-ELECTRIC

Retrieve guns, tackle, tools and other steel items from lake, river, plating tanks, drains or other hard-to-reach spots. Recover drills, taps, etc. from sweeping. Clear alley of harmful tacks, nails. Many other uses. Pays for itself quickly. **GUARANTEED.** Try any magnet one week. Money refunded if you are not well pleased.

No. M-725 (Weights 54 oz.) Has pull of 225 lbs. on steel block. **\$15.00**
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No. M-650 (Weights 41 oz.) Has pull of 150 lbs. on steel block. **\$ 8.50**
No. M-600 (Weights 13 oz.) Has pull of 50 lbs. on steel block. **\$ 4.00**
No. M-300 (Hobbyist assortment of six small magnets) **\$ 1.50**

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\$3.95

- for planes, boats, midget cars
- 7500 RPM; 1 1/2 HP; ht. 3 1/2"; wt. 5 oz.
- precision machined for smooth operation

You just can't beat this price for a precision diesel engine! Streamlined, compact, easy to install. Thousands of satisfied users all over the world. Fast delivery if you **ORDER TODAY!** Send \$3.95 plus 25c postage.

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Models from 39.25 complete 12 ft. Runabout

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Free Catalog of all models

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With Foot Control

The Electric Throttle ("Speed-selector") sets whatever speed you choose electrically — releases instantly at a touch on the toe-button, or by applying foot brake. Banish foot and back strain for good! Install it yourself. Price, \$17.50 F.O.B. Check or C.O.D. Several State franchises open. Dealer inquiries invited. Give car, make, and year. Pays for itself in gasoline savings.

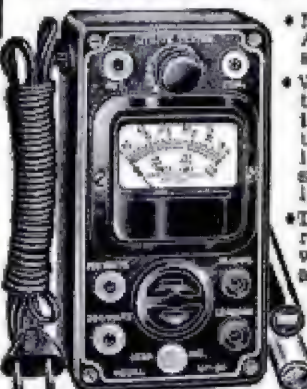
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The NEW Model 50 UTILITY TESTER

FOR REPAIRING ALL ELECTRICAL APPLIANCES-MOTORS

an all-around electrical trouble shooter



- Measures A.C. and D.C. Voltages, A.C. and D.C. Current, Resistances, etc.
- Will measure the current consumption while the appliance under test is in operation. The appliance or utility may be plugged directly into the front panel receptacle. A special pair of insulated clip-end leads is included for motors, etc.
- Incorporates a sensitive direct-reading resistance range which will accurately measure all resistances commonly used in electrical appliances, motors, etc. This range will enable continuity checks and tests for shorts and opens.
- Will test thermostats, radio tube filaments, bulbs, fuses, fluorescents, condensers, switches, field coils, circuit breakers, lighting systems, etc.

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Your car gets new pep, new power with amazing, **RING-RE-NU!** Eliminate costly overhaul, cut oil waste this easy way... Simply pour hard-hitting P.V.R. Compound into your carburetor... cleans engine of tars, gums, and varnish... then squeeze heavy-duty **RING-RE-NU** into cylinders... restores compression and "new car" power! stops oil burning!... good for 10,000 plus miles. Guaranteed harmless to the finest engine.

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To stop oil-pumping, replace worn engine
connecting rod bearings

Trouble sometimes comes from unexpected quarters. An oil-pumping engine is an example. You may blame the piston rings for oil pumping caused by excessively worn engine bearings. *Correction must start at the worn bearings!* They shorten the life and decrease the efficiency of the best of new piston rings. Give new rings a chance to do their own job—check for worn engine bearings, too! Replace, in sets, with Genuine Federal-Mogul Oil-Control Bearings for renewed power and economy. Ask your mechanic!



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DETROIT 13, MICHIGAN

CONTROL OIL-PUMPING
WHERE IT STARTS—REPLACE WITH

FEDERAL-MOGUL
OIL CONTROL BEARINGS

the core of the traffic problem. And they have disadvantages. They are expensive—it costs \$1.75 to ride the length of the Jersey Turnpike. They can't carry enough volume to pay for themselves in remote sections where traffic is light. They don't help city congestion—in fact they make it worse by funneling more cars into already overloaded city streets.

One answer is the free expressway—a multilane artery that dives into the heart of a city, piling up in two, and sometimes three or four levels. These fabulous free-ways can cost upward of \$10,000,000 a mile, against \$1,000,000 for a superhighway in open country. But in jammed places like New York they have proved their worth. Today, New York City is encircled by such freeways fanning out to suburban areas in every direction. Motorists heading for Long Island via the George Washington Bridge never touch a Manhattan street. In Queens, the Furman Avenue Highway, connecting Brooklyn-Manhattan bridges with Long Island expressways, is a cantilevered roadway in two levels that cling to the side of a ledge like shelves.

Other cities are creating even more fantastic systems. Boston is building a \$70,000,000 Central Artery that bores into the business and shipping district from the west, distributing traffic as it goes through 32 ramps. This monster freeway links with an east expressway that weaves through the jumbled city in three levels—one elevated, one at street level and one underground. It bridges the Charles River in two levels—one way each.

In Cleveland, an eight-lane expressway is spearing into town—leaping across a 6000-foot valley industrial area via a monster viaduct. In Detroit, the Edsel Ford and John C. Lodge expressways are already carrying cars nonstop along a sunken roadbed into the city's heart.

Sprawling Los Angeles, with a population increase of 150 percent since World War II, is connecting its vast limits with a total of eight expressways. The eight-lane Hollywood Freeway linking downtown Los Angeles with Hollywood is the latest in a system so huge that the service road beside one speedway is itself a limited-access multilaned expressway. At one point the new Hollywood Freeway intersects with four others in the heart of town—the southbound Santa Ana Freeway, Arroyo Seco Freeway, Ramona Freeway to the southeast and the Harbor Freeway to the coast.

But most spectacular of all is Chicago's Congress Street project—due for partial completion by 1955. One of nine new expressways to carry millions of cars in and

(Continued to page 246)

HYDRAULIC SPEED REDUCER

(ITEM #115) WITH FINGERTIP CONTROL
USE FOR: • Reamer Drives • Midget Cars • Feed Mills • Canning Machines • Conveyors • Lathes • Milling Machines • Motor Boats • Cream Separators • Garden Tractors • Pumps



Variable output speeds from 0 to input speed available by moving control handle. Locking handle maintains setting. Use input power of 1/4 to 1 1/2 H.P. This Westinghouse-Oil Gear Unit consists of a variable displacement hydraulic pump feeding a fixed displacement hydraulic motor. Adjustable relief valves set at factory for 100 inch pounds of torque may be reset up to 180 inch pounds. Independent reverse control allows full output power and speed selection in either direction of rotation. Shafts measure 5/8" diam., include keyway. Input rotation is counter-clockwise facing shaft. Recommended input speed not to exceed 750 R.P.M. Overall dimensions, 7 1/2" x 7 1/2" x 11 1/2". Gov't acquisition cost, \$428.00. Ship. wt. 31 lbs. Complete with 2 qt. of oil and full instructions. **54.50** F.O.B. Chicago.

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★ and **SAVE** ★
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SPECIAL! For July Only!



Continental 39.50
"Red Seal"
1 1/2 H.P.
ENGINE

Item #97—Power for lawn mowers, garden tractors, pumps, generators, compressors, tillers, rakes, plows, feed mills, milking machines and motor scooters. Brand new Continental "Red Seal" 1 1/2 H.P. gasoline engine, Model AA-7, single cylinder, 4 cycle, with 6:1 gear reducer. At 1800 R.P.M. engine speed, shaft turns at 300 R.P.M. Complete with muffler, starter rope, oil bath, air cleaner, killer button and governor. Economical to operate—runs 5 hours on one gallon of gas. Shipping weight 80 lbs. **SATISFACTION GUARANTEED.** A \$74.00 value. A "Special" for July only. **39.50** F.O.B. Chicago.

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200 GALLONS PER MINUTE



For Draining Basements
Fire Fighting • Irrigation
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For high volume commercial, home and industrial use. Standard 2 1/2" pipe thread inlet, twin 1 1/2" pipe thread outlets. Ball bearing supported 3/4" shaft. Easy priming. Rotation, counter-clockwise facing shaft. Gov't. acq. cost \$145.00. Complete with full instructions. Ship. wt. 35 lbs. **39.50** F.O.B. Chicago.

Suction Lift	Head Pressure	Gal. Per Min.	H.P.	R.P.M.
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10'	65'	200	5.2	3500
10'	60'	40	1.5	2500
10'	50'	140	5.0	3500
10'	30'	100	3.0	2500



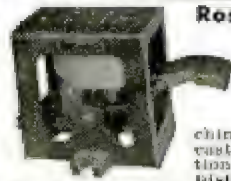
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EXTRA HEAVY DUTY DOUBLE ACTION HYDRAULIC CYLINDER

Item #224. 3 1/4" bore, 24" stroke, will lift 8250 lbs. with 1000 P.S.I. line pressure. 1/2" pipe thread ports—1 3/4" stressproof ground, polished and plated—solid steel shaft. Overall length closed 36", 1 1/4" steel wall cylinder barrel, clevis mounting at base and shaft. Features—Tie Rod construction. Honed barrel. Ship. wt. 50 lbs. **39.60** F.O.B. Chicago.

Self-sealing Hydraulic Hose Coupler

Ideal for use where hydraulic systems are frequently disconnected or changed, as on towed farm implements. Each half has 1/2" female pipe thread at ends. Length—3 3/4". Width—1 1/2". Shipping Weight 1 1/2 lbs. Price **4.95** F.O.B. Chicago.



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BRAND NEW—Item #60—For double-acting pneumatic devices. Fine for operating presses, air vises, air machinery of many types. Heavy duty cast construction. No neutral position. Maintains pressure against the piston when the foot control is in the "Up" position. Threaded for 1/2" pipe. Dimensions of valve body: 7 3/4" long x 4 1/4" width x 7 1/2" high. Net weight 28 lbs. A **19.50** F.O.B. Chicago. \$64.00 value for only.

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Built to rigid U.S. Navy Air Force specifications. Rated A.C. output: 120 volts, 1200 watts, 10 amps at 800 cycles. A.C.-D.C. output: 60 amps at 24 volts. Use A.C. power source for house trailers, lights, portable electric tools, and A.C.-D.C. series wound electric motors. When driven by 3 H.P. gasoline engine, makes a dandy auxiliary light plant. The D.C. output is suitable for battery charging, welding, and marine use. Ball bearing construction, 1/2 inch spline shaft. Dimensions: 15"x8"x10". Shipping Weight: 50 lbs. Gov't. Acquisition Cost Over \$300.00. **50.00** GROBAN'S Special Value F.O.B. Chicago.

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HEAVY DUTY HYDRAULIC and AIR EQUIPMENT

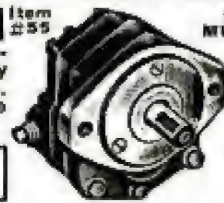
Large supply of new labor-saving, economical hydraulic equipment in many types and sizes. Use these positive, highly efficient many pressure hydraulics on presses, arbors, lifts, loaders, power control, positioning, brakes, plastic dies, auto frame alignment, etc.

ALL ITEMS BRAND NEW — UNCONDITIONALLY GUARANTEED

ITEM #1038

Item #1038—Double acting hydraulic cylinder, 3" bore, 36" stroke, 1/2" pipe thread ports, 1 1/4" solid steel shaft. Overall length closed 49", clevis mounting at base and shaft. FEATURES • Cup & Chevron Packing • All Welded Construction • Precision Ground and Honed Construction • Will lift 7000 lbs. using 1000 P.S.I. line pressure. Weight (net) 37 1/2 lbs. **50.00** F.O.B. Chicago.

Item #150—Double acting hydraulic cylinder, 2 3/4" bore, 12" stroke. Use either foot or clevis mounting. Will lift 4400 lbs. using 1000 P.S.I. Overall length 18 1/2". Shipping weight 8 lbs. **18.00** Postpaid.



BRAND NEW MULTI PURPOSE Hydraulic Pump or Motor

Rated 8 Gal. Per Min. At 1500 R.P.M.—Delivers — 1000 P.S.I. Using 6 H.P. — Reversible Rotation—3/4" Pipe Thread Inlet and Outlet Ports—1/4" Drain Port—3/4" shaft with keyway and flat for either direct or pulley drive. Dimensions—5 3/4" high, 7 1/4" long, 5 1/4" wide. Shipping weight 18 lbs. **45.50** F.O.B. Chicago.

Item #42—Double action hydraulic cylinder, 4" bore, 18" stroke. Rated lift capacity with 1000 PSI line pressure is 12,500 lbs. Ship. wt. 30 lbs. **32.50** F.O.B. Chicago. An Excellent Buy for...

Item #16C—Double acting hydraulic cylinder, 1 1/2" bore, 26" stroke. Will lift 1780 lbs. with 1000 PSI line pressure. Weight 8 lbs. A \$35.00 value. **16.95** Now only... Postpaid

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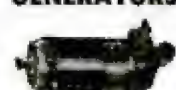


ITEM #183

Item #183—3000 to 4000 WATT GENERATOR SET — FEATURES — Power for your home or business. Simply connect to power panel or house circuit. • Constant voltage regardless of load. • Push button start or stop. • Easily made full automatic start or stop. **SPECIFICATIONS** — Sizes 19"x30"x48". Steel skids, weatherproof housing, requires no building. Wt. 725 lbs. • Hercules 4-cyl. 10 HP gasoline engine. Load governor. Oil filter. Quiet muffler, 6-volt starter, generator. • Hobart 115 volt, 60 cycle, 3000 to 4000-watt generator. Furnishes either single or three-phase power, 2 or 3 wire. • Panel contains oil gauge, voltmeter, ammeter, circuit breaker, voltage regulator, start button. Today's cost over \$1200.00. **SALE PRICE, 465.00** F.O.B. Chicago.

Item #300—Model C18 — 3 KW — 110 Volts D.C. This mighty mite develops 3 KW—28.5 amps. D.C. Standard Delco generator direct coupled to a Model Z2P Briggs and Stratton 1 cylinder, 5-7 HP, air cooled, rope starting gas engine. Instruments include voltage control rheostat & voltmeter. Ideal for Power Tools. **295.00** Wt. 275 lbs. F.O.B. Chicago.

D. C. GENERATORS



Item #91 — Type R-1, rated 300 Amps. — 30 Volts, Mfd. by Jack & Helntz. Gov't. Acq. Cost \$380.00. Ship. wt. 55 lbs. Dimensions 16"x10"x7". **35.00** F.O.B. Chicago.

Item #176—Type L-3, Rated 25 amps., 24 volts. Manufactured by Leeco-Neville Co. Ship. wt. 30 lbs. Dimensions 12"x8 1/4"x5 1/2". **16.50** F.O.B. Chicago.



Item #90—Type P-1, rated 200 Amps.—28 Volts, 2500 RPM. Mfd. by General Electric, Ford, Delco-Remy and Westinghouse. Gov't. Acq. Cost \$300.00. Ship. wt. 55 lbs. Dimensions 15"x9"x6". **22.50** F.O.B. Chicago.

Item #192—12 volts, 15 amps. For use with external voltage regulator. Model GPU 4103. Autolite D.C. Generator. 4 bolt flange mounting. L 8 1/2", W 4", H 6". Removable drive gear. Ship. wt. 14 1/2 lbs. **18.00** \$15.00, with voltage regulator.



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For with the GRIP-SNIP you can do 5 different jobs and do them quickly, easily and well. It's 3 tools in 1.

1. **Grips like a vise...** Doesn't slip. Doubles your strength through compound leverage.
2. **Cuts wire easily...** even when it tightly hugs a flat surface.
3. **Holds nuts like a wrench...** powerful parallel jaws, extra leverage.
4. **Gets into tight spots...** jaws have small nose.
5. **Unkinks wire...** Run wire through throat to straighten or pull.

See the 4½, 5½, 6½ and 8 inch lengths of the GRIP-SNIP at your hardware dealer. Prices range from \$2.19 upward. Or for further details, write Dept. 20G.

*Trade Mark



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out of the metropolis, this eight-lane 60-mile-per-hour superhighway will be carved directly into Michigan Avenue from the west, just south of the Loop. The speedway's cost, financed by city, state and county, is estimated at \$92,000,000. To make way for it, whole blocks of buildings have been demolished, cutting a block-wide swath right through the center of Chicago.

The incredible speedway will carry a full-fledged railway down its median strip, so that cars and trains proceed side by side. Going west, the highway dips through a deep underpass that goes beneath multiple tracks of the LaSalle Street Station. A swirling clover leaf farther on will siphon off incoming traffic. Beyond this, the highway's 12-foot-wide vehicle lanes will leap the Chicago River by means of twin bascule bridges, built together so they resemble one bridge. Either can close for repairs without knocking out the other. On the other side, the superhighway passes directly through the middle of Chicago's 13-story post-office building, via a 120-foot-wide tunnel that was built into the structure by farsighted city fathers who saw the coming of the monstrous artery back in 1933. From its hole in the post office, the massive road shoots skyward on elevated stilts and bumps into a nine-square-block interchange.

Between expressways and superhighways, many experts think we may dig ourselves from our traffic muddle. But new problems are arising. Speed, for instance. On all these new roads the temptation to "let 'er out" is strong, and turnpike police are using every means possible to nab offenders. In Connecticut, parkway police have set up radar cameras that clock speeders and automatically take pictures showing the license plates on the rear of the cars. Trip devices are doing the same on many pikes.

But the major reason for the spectacular accidents on the high-speed highways, according to AAA safety engineers, is the fact that most drivers don't yet know how to handle a vehicle rocketing along at a legal 60 to 70. "You can't maneuver a car at 70 the way you might at 50," they point out. "A quick turnout that might avoid a collision at 50 can cause a rollover at 70. Distance 'disappears' terribly fast at 70. Unfamiliar drivers are too slow in braking, and incline to 'over drive' their lights at night. Road hypnosis is a continual danger to guard against."

Engineers are busy taking the bugs out of their new speedways right now, in order to prevent catastrophes by the use of better warning and policing devices. But cars will always go where they're steered. ★ ★ ★

Ford Track Tests save you money



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and here...



and everywhere

Like Ford belts and hoses, all Genuine Ford Parts are carefully checked and rechecked after punishing track tests. This is your assurance that they're made *right* to fit *right* for quick installation and long life . . . saving you money on both replacement *and* repair time.

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The quality of materials, the dimensions, the workmanship used in fan and generator belts bearing the Genuine Ford Parts label . . . all were track-tested by Ford engineers before these products were approved for manufacture and general distribution. Thus, you are assured that the belts you buy under this label have been designed to require less tension for efficient operation, to give full traction with pulley surfaces, to fit precisely, minimizing twist, distortion and vibration, to resist destructive oil and dirt. These superior advantages have been proved by actual tests.

Yes, here again, radiator hoses of varying materials were track-tested and minutely examined after miles and miles of operation. The hose selected to carry the Genuine Ford Parts label has a tough Neoprene lining that resists corrosive radiator solutions. This feature tends also to cut down chipping and sloughing off, common sources of radiator clogging and hose breakdown. Molded without seams and reinforced with knit rayon, Genuine Ford hoses have the "give" to withstand vibrations, shocks, extreme temperatures . . . and their resistance to rust, oil, grease and dirt means added life.

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Hand cranks coordinate action
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Model Toys, write

**THE CHAS. WM. DOEPKE
MANUFACTURING CO., INC.
ROSSMOYNE 2, OHIO**

Multi-Purpose Battery-Operated Audio Amplifier for Beginners

(Continued from page 212)

and F. These rubber pads serve to reduce vibration, especially when using the microphone. Any other soft material such as a pillow may be used behind the speaker. Do not use rock wool or similar material as stray particles may get into the motor gears.

A simple feedback circuit used in this audio amplifier reduces distortion and no adjustments are required. As all makes of phonograph records must reduce bass-note response below middle C to prevent cutting between adjacent grooves, it is desirable to put them back with the amplifier. Do this with a built-in bass-boost circuit in the phono G-1 circuit of the type 1G6-GT tube using R1, R2 and R3 resistors, and capacitor C1. Note that the midjet variable tuning condenser C7, volume control R7 and the mike-phonos switch all are mounted on a thin copper shield tracked on the rear of the front panel; see Fig. 2. Use rosin-core wire solder and solid push-back wire No. 20 for all amplifier wiring except for the common-ground bus bar which is No. 14 bare tinned copper. The 4-wire battery cable should have flexible stranded wires. All resistor values are given in the chart in Fig. 2. The capacitor values appear in Figs. 1 and 2. The standard A-battery plug is No. 274 and the B-battery plugs are No. 273. Detailed student material list R-421 is available from Popular Mechanics Radio and Electronics department upon receipt of ordinary letter postage. ★ ★ ★

Square-Root Calculator Allows Fast Figuring



Speeding automatic square-root calculations, a new business machine aids designers, engineers and statisticians. Not much bigger than a typewriter, it doesn't create a space problem. Figures are punched on a bank of keys to register the problem, and the answer appears in a row of tiny windows at the top of the machine.



An apple for the teacher!

How television helps your child to know and grow

Television has been aptly called an extension of human sight. It broadens the horizons of every viewer—young and old, and for that reason alone merits the title “teacher.”

But when you see television in its *deliberate* role of educating the youth of America—with specific programs aimed at every age level—you will understand why leading educators predict that today’s generation of children will be the most intelligent and best informed of all.

TV takes you up the “grades”—all the way to informative programs like *Youth Wants to Know*, *American*

Forum of the Air, *Today at the UN*.

And then, there are the great and historic events broadcast by TV and radio: the inauguration of a President, the coronation of a Queen.

Today, thousands of schoolrooms are TV-equipped for reception of programs of educational interest. And by means of closed-circuit TV, classrooms can be visually unified for lectures and demonstrations, making television a lecture hall of wide proportions and a vital new tool in teaching.

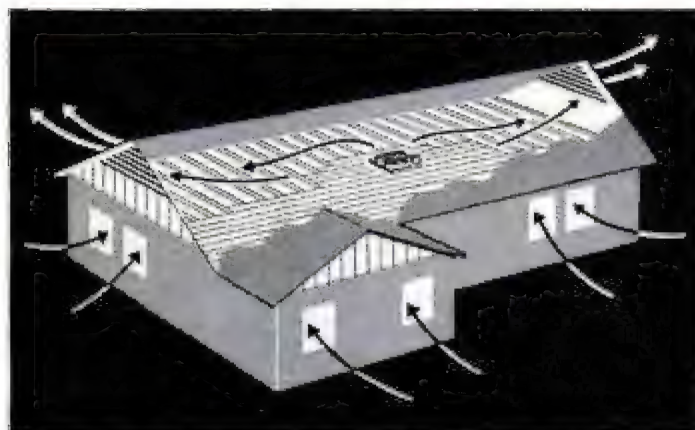
Just as NBC—a service of RCA—pioneers programs that teach your child to know and grow, so one of the great objectives of RCA is to make television the most effective instrument of education ever known.



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This modern ventilating fan pulls in cool air through windows, exhausting hot stuffy air through attic louvers. In hottest summer months it circulates cooling breezes through every room in your home. The quiet, powerful Hunter Attic Fan requires little or no maintenance, costs only a few cents a night. It is backed by Hunter's 65 years of fan experience.



You can easily install a Hunter Attic Fan in your home. This compact unit is complete with automatic shutter and modern metal trim to cover the ceiling opening. No suction box to build; no accessories needed. Fan requires only 17 in. attic clearance. Look in your classified directory and phone the Hunter dealer. You can have cool comfort at low cost.

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HUNTER ATTIC FANS

percent showed 94 to 96 miles per hour." Steering around mountain curves with the power unit required almost no effort and, coming out of a sharp corner, the front wheels would return to a straight course with no steering-wheel help needed. Roadability was excellent and stability good. On corners and even over rough roads and back trails, the car handled well. New coil springing and improved shock absorbers control the ride and make it above average for a car of Chevrolet's weight. New rear suspension also helps to prevent excessive roll or sidesway on 1953 models.

The Chevrolet long-stroke ($3\frac{1}{16}$ inch) engine develops excellent power and will get down and really "lug" when the going is tough on steep mountain grades.

Chevrolet's Powerglide transmission is a hydraulic-operated, oil-cooled automatic unit with a new three-element torque converter. Planetary gears provide reverse and automatic low. The 1953 unit has been improved for quick getaway. It has the same effect as shifting manually from low to drive while accelerating, but the torque converter does it faster and better. Maximum torque-converter ratio is 2.1:1; planetary-gear ratio, 1.82:1. Over-all ratios are: Drive, 2.1:1; low and reverse, 3.28:1. The rear-axle ratio is quite high at 3.55:1.

The shift selector is quick and positive but still lacks an indicator light which many drivers would appreciate. Low and reverse, located next to each other, make quick-action rocking of the car in snow or mud possible. Shifting both up and down as the changes in gear ratios automatically take place is smooth and without noticeable effort. From 20 to 40 miles per hour (depending on throttle opening) the Powerglide shifts automatically into high gear.

Powerglide definitely does have some slippage, which is most noticeable from a dead start to 35 miles per hour. Above 35 the unit becomes positive and from then on it operates as though the connection between the engine and the rear wheels were rigid. In drive range, Powerglide automatically selects either low or cruising range to make the most efficient use of engine power in every driving situation.

My gasoline mileage was good (see economy chart). I found regular gasoline to be satisfactory as did 60% of the Powerglide owners reporting.

I found no rattles, squeaks, dust or water leaks in the solid and well-built body. Doors are easily opened by push button and $3\frac{1}{4}$ turns of the window crank are required for opening and closing. As in previous years, the doors can be locked without use of key by depressing the button on the window

(Continued to page 252)

Make Your Own POWER TOOLS Fit With a ed Shop!

Enjoy Fine
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**New Popular Mechanics Book
Shows How to Make 60 Tools
from Scrap, Discarded Parts!**

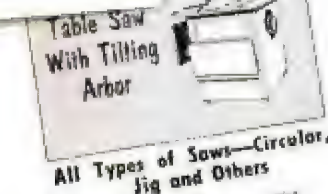
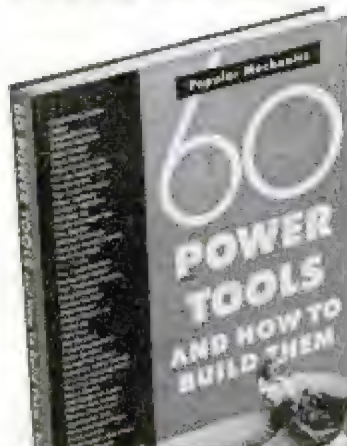
Get SIXTY POWER TOOLS AND HOW TO BUILD THEM, the sensational new book in the Popular Mechanics Craftsman Series. Build your own lathe, drill press, sander, circular and band saw and other power tools at a cost of only a few dollars each. Use old auto parts, pipe, wood and odds and ends that cost little or nothing. Every detail of construction is given in plain language you can understand and follow in this timely how-to-do-it book.

**200,000 Copies of Earlier
Edition Now in Use**

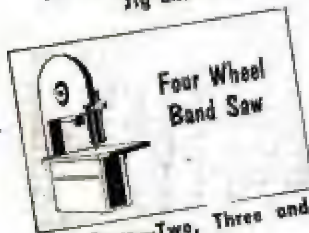
More than 200,000 copies of the earlier book "Forty Power Tools You Can Make" have been sold. This is a brand new book with new material and new machines — SIXTY POWER TOOLS AND HOW TO BUILD THEM. Hundreds of pictures and plans show every step to follow in making the power tools you want. Actual photos of finished machines included. Note partial list of power tools you can make below.

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Mail the coupon today with only \$2.50 or we will send book C.O.D. Your money back if you return the book. You'll be amazed with the practical tools you can make and how little they cost. With this book you can have a complete motorized workshop and save hundreds of dollars. Mail coupon today.



All Types of Saws—Circular,
Jig and Others



Band Saws—Two, Three and
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**Save Hundreds of Dollars
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Make All of These**

- Jig Saw from Old Sewing Machine
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- Drill Presses from Old Auto Parts and Pipe
- Precision Drill Press for Model Makers
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- Power Hacksaw
- 10-inch Table Saw With Tilting Arbor
- Disk and Spindle Sander
- Power Scroll Saw
- Thickness Planer—10 inch
- Wood Shaper from Pipe and Plywood
- Disk Sander, 12 Inch, With Tilting Table
- Motorized Hand Plane
- One-Motor Workshop
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- Heavy Duty Grinder
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- and others—60 Power Tools in All.



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I understand I may return book within 7 days if not satisfactory and you will refund full purchase price.

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Grandfather was a blacksmith

*"Working the steel while
it's hot makes it strong.
Heat treating makes it
tough."*

**Originally tough forged for
professional craftsmen**



**WORLD'S
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Now

**We've taken Grandfather's
wealth of experience and
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**Each hammer
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23 hand
operations**

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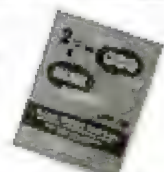


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complete with 6" rubber pad — 6" lamb's wool bonnet — and three 6" sanding discs.



Finishes flat surfaces to "piano" smoothness with No. 980 Orbital Attachment.

Grinds, buffs, wire brushes. A powerful bench unit in the No. 9668 Stand.



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FREE FOLDER
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Greenfield, Mass.



ledge and pushing handle. This is correct. I didn't like this was I once forgot the keys.

The heating and ventilation button on the door is excellent with convenient. The upper half of the horn interferes with vision in that when in line with some speedometer the gasoline gauge, depending on the of the driver. The upper portion can be moved quickly with a hacksaw (what I would do if I owned a Chevrolet) for improved instrument vision.

The glove compartment is large. I like the right-hand combined switch and starter, but I still don't like the idea of the engine still running when the ignition key is removed with the switch in "on" position.

The emergency brake is operated by the right hand and released by a twist of the wrist. The foot brakes are the best I ever have found on a Chevrolet as the pedal movement is softer and the entire brake action is better than ever before. There was little fading on mountain roads.

The driving position is comfortable. Interior finish of the de luxe Bel Air is above average for a car in the Chevrolet class. The choke is automatic, which many reported they did not like. I still prefer the old-time hand choke but, like automatic transmissions and power steering, it looks like the automatic choke is here to stay.

The counterbalanced hood is easily operated. The rear luggage compartment is large enough for a 115-inch-wheelbase car and the lid also is counterbalanced.

Chevrolet models are also available with Chevrolet's time-proved three-speed transmission. Chevrolet does not offer overdrive. The firm claims the high rear-axle ratio of 3.70:1 allows the engine to "loaf" while cruising and therefore the overdrive feature is unnecessary.

In addition to the Bel Air and Two-Ten models which have the Blue Flame 115-horsepower engine and Powerglide as optional equipment, the One-Fifty model is offered with the Thrift King 108-horsepower engine. All Chevrolet engines are 6-cylinder, in-line, overhead valves, with a bore of 3 $\frac{1}{16}$ inches and a 3 $\frac{1}{16}$ -inch stroke.

A new all-weather ignition system for 1953 has been added with a better distributor, new-cap, points and cam. A full-pressure lubrication system (new this year for Chevrolet) is offered in the Blue Flame engine. Chevrolet offers the most horsepower in the lower-price bracket. Powerglide models have increased horsepower to 115 by use of a higher engine-compression ratio. The hand-shift models have 108 horsepower. ★ ★ ★

PORTABLE LIGHT PLANTS

350 Watt Plant (Item 273) 115 v. DC. 1 1/2 hp. Briggs Engine. Perfect for lights, radios and small power tools, etc. Wt. 65 lb. Factory price..... **\$99.75**

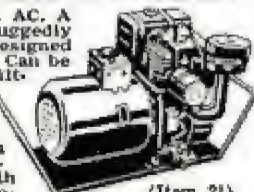


(Item 24)

PUSH BUTTON START
AC Plant 500-700 Watts
—115 v.-60 cyc. Powered by a rugged 2 hp. easy-starting Briggs gas engine. No wiring necessary. Just plug in and operate. Plenty of current for any oil burner, freezer, brooder, emergency lights, etc. which require up to 700 w. Ideal for Civil Defense, Fire Depts., trailers and camps. Complete with Voltmeter and built-in winding to charge 8 v. auto batteries. Item 24. Wt. 85 lbs. He prepared if war or storms knock out power lines. Reg. \$275.00 value. **\$143.50**
700-800 Watt Plant (Item 44) same as above but larger engine. **\$169.95**
1000-1200 Watt Plant (Item 45) same as Item 24 but with larger generator and engine. **\$199.50**
1500-1700 Watt Plant (Item 20)—Similar to Item 24, but has three times more capacity. Wt. 173 lb. Factory price **\$279.50**

MASTER-LITE 2500 Watt PLANT

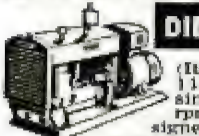
110/120 v. 60 cyc. AC. A powerful plant, ruggedly constructed and yet designed for easy portability. Can be started by rope or built-in 12 v. electric push button starter. Built-in winding to charge battery. Powered by a big 5.10 Briggs engine, complete with all accessories. Includes control box, voltmeter and handy plug-in power receptacle. Ideal for permanent or stand-by service. Wt. 225 lb. Reg. \$329.50. **\$329.50**
GIANT 2000-2500 Watt Plant—110/120 v. AC. belt driven so that engine may easily be utilized for other purposes. Powered by a rope start, 8 HP. engine. Wt. 230 lb. Regular list price \$345.00. Factory price (Item 31)..... **\$299.50**
Generator only and control box (Item 31a) **\$169.50**
3000-3500 Watt Plant (Item 108) 110-220 v. 60 cyc. AC. Belt driven with Wis. engine. Push button start. Wt. 370 lb. Heavy duty **\$399.50**
Generator only for belt drive. Wt. 115 lb. (Item 198a)..... **\$239.50**
3000-3500 Watt Plant (Item 23) 115 v. 60 cyc. AC. Push Button Start. Direct Drive. Wt. 270 lb. Factory Price..... **\$379.50**



(Item 21)

HI-LINE 6000 WATT PLANT

(Item 162) Push Button Start, 115-230 v. 60 cycle AC. A brute of a power plant with a rugged 13 hp. Wisconsin engine. Plenty of electricity for ranges, water heaters, freezers, pumps, machinery, etc. Affords both 110 and 220 volt. Ideal where heavy current is needed. Easily worth \$995.00. With self starter. **\$645.00**
Same plant but with Tank Start (Item 166)..... **\$585.00**
Generator and control box only, belt driven. Use your own engine or tractor. Wt. **\$345.00**
240 lbs. (Item 163) Factory price
We make fully automatic controls to operate any of above light plants. Write for details.



(Item 162)

DIESEL LIGHT PLANT

(Item 1600) Diesel Master—11-12 kw. 115/230 v. AC single or 3 phase. 1800 rpm. direct connected. Designed and engineered for permanent power installations. Assures efficient, dependable, low cost operation where heavy current is important. Wt. 1350 lb. Reg. list \$2650.00. **\$1895.00**
10-11 kw. GAS DRIVEN PLANT. 115-230 v. 60 cyc. AC, powered by 4 cylinder Wisconsin air cooled engine. Belt driven. With self-starter. Constructed similarly to Item 162 but much larger. (Item 217) Wt. 900 **\$1245.00**
We make all sizes up to 25,000 Watts—Write.



(Item 217)

ELECTRIC WATER HEATER

(Item 76) Modern electric hot water heater. Uses any tank with threaded openings 1" or 1 1/4". Works just like heater costing \$100. or more. Goes on and off automatically to heat water to desired temperature—using electricity only when needed. Takes only 1/4 to 1/2 cent of electricity per gallon of steaming hot water. Heater element and thermostat, wt. 8 lb. Regularly **\$14.95**
Heater only for manual temperature control. Wt. 3 lb. **\$7.95**

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MASTER GARDENER

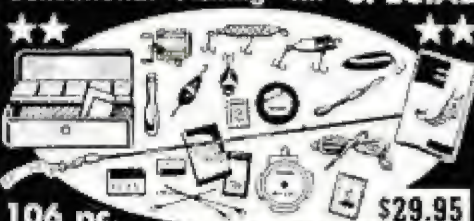
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Tractor shown with 20" Rotary Mower Attachment (Item 206)

Sensational Fishing Kit SPECIAL



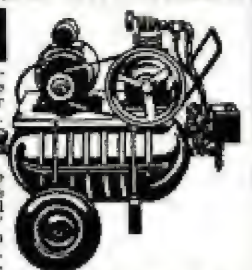
106 pc. **\$29.95**

"BIG STRIKE" FISHING SET

You'll enjoy every minute of every fishing trip with this sensational Master fishing equipment offer. This complete high grade set includes a famous 5' Deluxe glass rod with polished aluminum pistol grip handle shaped to fit the hand. Handle and rod eyes automatically align by keyed ferrule. Precision reel is equipped with silent gears, quadruple multiplying, level wind and adjustable click. Heavy duty tackle box has cantilever tray, baked enamel finish and plenty of room for all the plugs, spoons, spinners, nylon lines, hooks, sinkers, floats, scaler, rod bag, etc. Included in this giant set, 100 pieces in all—far too many to illustrate. Complete with 36 page guide on "How to Land the Big One." Easily worth \$75.00. Truly the BUY of the Month at **\$29.95**. (Item 175). **SPECIAL—106 pc. Special Deluxe set similar to the one above but with Aristocrat anti-backlash reel and tip-proof, two tray tackle box. (Item 170) Factory price..... \$32.50**

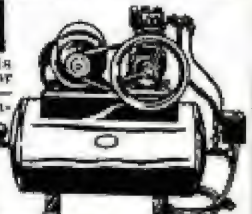
MASTER AIR COMPRESSOR

(Item 209) High pressure type for large volume of air for heavy duty service. For paint spraying, inflating truck and auto tires greasing and the hundreds of other jobs done by compressed air. Piston type. 2" bore compressor with built-in air filter. Master built with hi-strength alloys and precision bearings. Stainless steel tank. 12"x24". 2100 cu. in. cap. Safe up to 500 lb. Equipped with automatic switch that starts and stops motor to maintain desired pressure (up to 150 lb.) and check valve, safety valve, gauge, shut-off valve, 20 ft. air hose and tire chuck. Beautifully balanced on ball bearing wheels and rubber tires. Low factory prices. With 1/2 hp. 110 v. A.C. motor. (Reg. \$175.00) **\$98.50**
(Item 209) With 1/2 hp. motor. Reg. **\$119.50**
With 1 hp. motor. (Item 209A) **\$109.50**
With 2 hp. Briggs Gas Engine. Reg. \$199.50 (Item 209B) **\$109.50**



MASTER SHOP COMPRESSOR

Big and rugged. This stationary compressor provides 8 c.f.m. of air for industrial uses, powered by heavy duty repulsion induction 3/4 HP. 115/230 v. motor. Factory type twin cylinder compressor designed for continuous operation. Mounted on heavy 20 gal. steel tank. Complete with unloader type automatic switch, pressure relief valve, check valve, gauge, shut-off valve, and 20 ft. heavy duty air hose. (Item 209H) Regular retail \$319.50. Factory price **\$189.50**
Write for prices of compressor only. A complete line of spray guns and air tanks available.



EXTENSION CORD



Heavy duty, made of Buna insulated #14-2 conductor stranded wire encased in a treated braid jacket moderately flexible and ideal where frequent coiling is not required. Resists oil, grease or water. Use indoors or out. Complete with heavy rubber plug and outlet. (Item 16) **\$1.99**
40 ft. 2 1/2 lbs. **\$4.95**
Combination 2-40 ft. and 1-20 ft. (total 100 ft.) **\$4.95**
100 ft. length (1 piece) **\$4.95**

NEOPRENE EXTENSION CORD

#16, 2 conductor stranded wire, extremely flexible, ideal for hedge trimmers, lawn mowers, power tools, etc. Tough and rugged, withstands any abuse. Complete with rubber plug and outlet. 40 ft. (Item 6a) Wt. 2 1/2 lbs. Regularly \$4.95. **SPECIAL..... \$2.49**
100 foot length (1 piece)..... **\$5.85**
Wire only. No fittings..... **\$5.00**
NEOPRENE CABLE #14-2 (Item 185) Heavy duty, very flexible. 20 year quality. Wt. 9 lbs. 100 ft. A terrific buy at only..... **\$6.95**
NO. 12-2 POWER CABLE. Very flexible rubber covered, special outside shield for grounding power tools, etc. 50 ft. (Item 109) Wt. 8 lbs. **\$6.95**, 100 ft. (Item 200)..... **\$12.95**

32 Pc. SOCKET SET

(Item 59) Highest quality gear, non-removable sockets made by Husky. It's a useful matched chrome alloy absolutely the best. Complete range of 31 sockets from 1/4" thru 7/16" in 1/4" drive and 7/16" thru 1-1/16" in 1/2" drive; 2 extensions, reversible 1 1/2" ratchet, adaptor bit, slide head, all angle coupling, 2 end wrenches, 1/2" speeder handle and sturdy metal tool box. For prof. mechanics who want the best. **\$16.95**
Wt. 14 lb. Reg. \$49.50 (Item 59)..... **\$16.95**

44 Pc. SOCKET SET

Consists of above described set, but includes a big doghouse tool box with ample room for other tools plus a 5 pc. hi-chrome alloy combination wrench set and a 7 pc. offset wrench set. Easily worth \$49.50 **\$19.95**
(Item 59b)

52 Pc. SOCKET SET

(Item 205) Contains a complete set of sockets in 1/2" drive, 3/4" drive and 1 1/4" drive, plus all necessary extensions, handles, speeders, reversible ratchets, etc.; all unexcelled. Guaranteed against breakage. Beautifully matched chromed thin wall alloy sockets in a sturdy handsome steel tool box. Wt. 17 lbs. List Price \$62.90. Factory Special **\$26.95**

NEW MOTOR BIKE

Our Commando Motor Bike is trouble-free—carries amazing 5 yr. guarantee. Goes up to 150 miles per gal. on all roads. Speed to 40 mph. No oil or gas fumes. Easy automatic pedal or pull starting. Has new principle of power transmitted directly to rear wheel—accelerates quickly. Complete motor and kit ready to attach to your bike in one hour. Get FREE folder. Factory Price **\$125.00**
Complete motor and Chassis..... **\$199.50**



VENTILATING FAN

(Item 10) Mount in wall or ceiling to ventilate any area. Over range, removes kitchen smoke and odors. Easily installed in furnace pipes. Forces even heat to all rooms. Powerful continuous duty motor, 110-120 v. AC. Quiet, super efficient fan moves huge volume of air (40 to 800 c.f.m.) 8" Fan, wt. 5 lbs. **\$6.85**; 9" Fan, wt. 5 lbs. **\$7.85**; 10" Fan, wt. 7 lbs. **\$8.85**; 12" Fan, wt. 8 lbs. **\$9.85**. **HEAVY DUTY FAN.** Semi-enclosed motor, suitable for spray booths, restaurant exhausts, poultry houses, etc. 10" Fan, wt. 8 lbs. (Item 10E)..... **\$11.95**
12" Fan, wt. 10 lbs. (Item 10B)..... **\$12.95**



HEAVY DUTY D-C ARC WELDER

Use as portable or shop welder. Up to 800 amps. Senior model. Made for years of trouble-free, continuous service. Will handle light or heavy jobs. Easily welds up to 3/4" plate using 1/4" rods. Built-in air cooling system. Arc is easy to strike and hold, because of specially designed arc stabilizer. Hi-lo switch and dial control gives wide range of welding heats. Run welder at 2800 rpm. with tractor, jeep or 15 hp. gas engine, or 7 hp. elec. motor. Complete with instructions, gear, and double V belt or flat pulley. You can pay more, but you can't buy a better welder. Wt. 110 lbs. \$400 value at **\$99.75**
DUAL CONTROL MODEL same as above but with built-in dual rheostat for low heat **\$119.50**
WELDING KIT. Two 10 ft. leads, welding helmet, electrode holder, ground clamp. Sold only with welder at **\$10.50**
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DEPT. 66C

Burlington, Wis.



Line Material Co. photo

Runway lights being installed at Milwaukee throw a beam that is easily seen from every possible angle

You're Looking at Tomorrow's Airport

(Continued from page 96)

length of each side of the runway, a broken three-foot-wide center line and four distance markers, consisting of 75-foot-long white bars, indicating 500-foot intervals from each end of the instrument runway.

An earlier influence, dictated by econo-

my, was the standardization of runway lengths and strengths. It was ordered by the CAA when uncontrolled and uncoordinated, aircraft design threatened to produce hordes of transports impractical for use at all but a few big fields. The edict protected public funds used in airfield construction from being wasted on projects that would rapidly become obsolete. It shifted to designers the responsibility for

(Continued to page 256)

Lighted letter panels will guide pilots onto airports
Civil Aeronautics Administration photo



DRAINS ARE EASY TO CLEAN..In Minutes!

WITH NEW **U-NEED-A JET ACTION PRESSURE CLEANER!**



A SIMPLE HOME OPERATION



NO WORK

**SPEEDY, EASY & EFFICIENT
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THANKS TO THE LATEST INVEN-
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is a **NEW FRIEND** to solve an **OLD PROBLEM**. **NO MORE** drains that won't work because grease and grime have taken charge. **NO MORE** waiting for George to do it. **NO MORE EXPENSIVE PLUMBING BILLS**. **U-NEED-A CLEANS DRAINS** in a matter of minutes. Already in use in thousands of homes.

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A few turns of winged nut on anchoring hook will seal U-Need-A Drain Cleaner to all drain openings. Combining **AIR & WATER** pressure the U-NEED-A DRAIN CLEANER penetrates blocks & automatically flushes grease, grime and other foreign matter out of traps, branch and sewer lines, leaving drains sanitary, clean & fast flowing.

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END BELT SLIPPAGE—Get smooth pickup for your power mower, scooter or garden tractor with only throttle control.

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IT DOESN'T TAKE MANY
WEARMITES*
TO CHEW UP YOUR
CAR ENGINE!



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TRADE MARK REG.

ENGINEERED FILTRATION
traps them by the Millions!

Close-fitting parts in your car engine can be scored and damaged by the Grit, Dirt and Tarry Sludge your motor oil picks up. A WIX HEVI-DUTY Cartridge in your oil filter takes these engine destroying "Wearmites" right out of oil circulation. You can stop them from chewing vital engine parts—and your pocketbook.

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*WEARMITES are "engine termites"—the Grit, Dirt and Tarry Sludge that multiply in dirty oil and combine to destroy car, truck and tractor engines.



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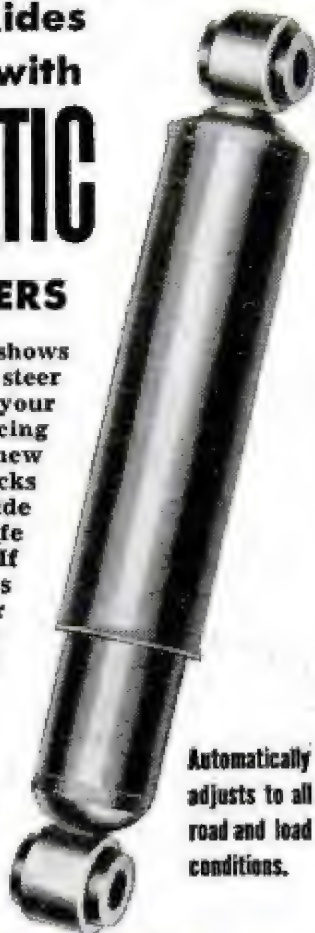
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Informative, instructive, tells the right shock for your car. Detailed instructions for removing old worn shocks, installing new. Send only a dime to cover handling cost.



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planning aircraft that could fly in and out of reasonable-size fields.

The safe-runway limits it set, from 3500 feet for small-airliner feeder service to 8400 feet for transcontinental express traffic, will continue indefinitely. These would be increased some under conditions of altitude or high temperatures. Even jet service is unlikely to disturb them. Some 8000 airline pilots, queried as to the kind of jet transport they wanted, agreed that even the long-distance type should be able to operate within 8000-foot runways.

Two other field-equipment features, already in use but destined for wider employment, are pit refueling stations, eliminating or reducing the use of trucks, and surface radar-detection equipment. The pits, supplying fuel from huge, underground tanks at up to 800 gallons per minute, have their own fire-protection facilities.

The other helper, surface detection, allows the tower men to "see" every inch of the field at night and in heavy fogs. In the past, during poor visibility, controllers have had to wait upon position reports from aircraft before they could safely order movements along runways and taxiways. Complicating their role was the fact that landings are permitted at most airports when the visibility is under a mile, yet the tower in which they worked was often more than a mile from the approach ends of some of the runways, too far away to see that they were clear. With radar they can spot any aircraft on the field and even guide its pilot.

Where safety and space permit, the CAA prefers airports to be within 25 ground-travel minutes of the community's center. Many will cut that time appreciably with the development of expressways. At Pittsburgh, for example, the new Pitt-Penn Parkway will make it a 15-minute trip. Rapid transit and bus facilities are also encouraged as means of cutting travel time.

The general trend is to functional-type terminal buildings, like the one St. Louis is getting. They permit better space utilization, are cheaper to build than monumental-style structures and easier to maintain. The CAA, realizing there is no foolproof way of forecasting a required size, counsels planners to design airports so that they can be economically enlarged or altered, depending on future traffic. Most of the new developments are scheduled for completion by stages, with five or ten years between main steps.

Inside terminals the basic problem is circulation, moving passengers expeditiously between planes and ground-transportation connections with the city. It can be

(Continued to page 258)



STOP DRIP

caused from sweating or condensation on cold water pipes. Turn idle basement space into play, work or store rooms. Just wrap cork-filled NoDrip Tape around pipes and joints and the job's done—permanently.



Roll covers about 10 feet of 1/2" pipe. \$1.69. Higher west of Rockies and Canada. Get at Hardware, Paint, Dept. Stores, or sent postpaid. Write for free circular. J. W. Mortell Co., 522 Burch St., Kankakee, Ill.



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 GENERATOR, AAF B-1, 24V, 300 amps, excellent, 60 lbs. \$29.95
 MOTOR, electric, AC 115V, 60c, split phase, 1/2" shaft, 1/2 hp, 22 lbs. \$9.95
 REGULATOR, voltage, 24V, to 200 amps, carbon pile type. \$2.95 (mounting base \$1.95)
 WINDSHIELD WIPER BLADES & frame, 48", use for cleaning windows, etc. \$1.25+
 MASK, oxygen, etc. \$1.50+
 CLAMPS, hose, mixed. 200 for \$5.00
 TELESCOPE, optical, 2 power 2x1" \$1.00+
 PUMP, oil, AAF type, small. \$1.95, large. \$2.95
 All job except those so indicated (*) which are postpaid. No parcel post over 20 lbs. Weights indicated are app. shipping weights.
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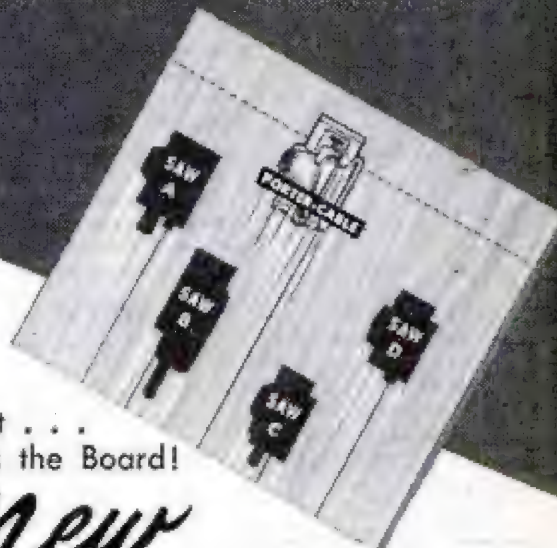


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in 7 1/2 seconds!



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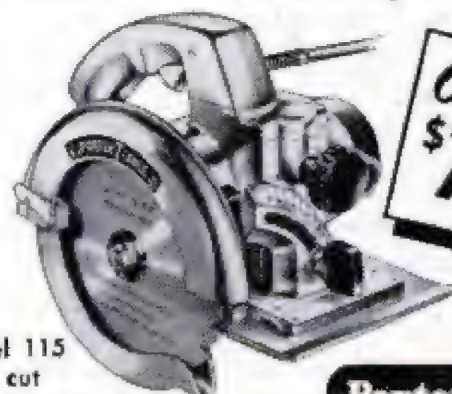
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In a recent series of on-the-site ripping tests comparing leading 7-inch saws, Porter-Cable's new "Contractor's Special" turned in this amazing speed record:

18.6% faster than Saw A 51.6% faster than Saw C
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Regardless of the depth of cut or type of wood used, the new "Contractor's Special" in every instance finished the cut far faster than any of the other saws tested! For example, on 3/4" Fir Plywood, the "Contractor's Special" averaged 7.5 seconds per 8-foot cut!

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\$75.

Model 115
2 3/8" cut

See this remarkable new 7" saw at your Porter-Cable Dealer's. Or mail coupon for full details.

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FULLY GUARANTEED

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NUTS
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Made of finest quality materials. Has lightweight aluminum handle and sleeve, and specially tempered dual blades of finest drill rod steel. Not magnetized. Six sizes available separately, or in boxed sets.

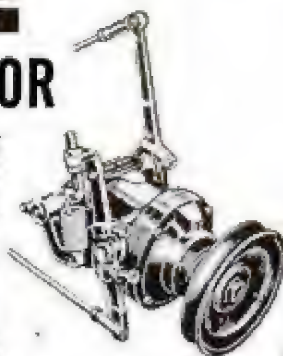
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fits ALL popular
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gasoline engines



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\$39⁵⁰

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solved satisfactorily in either a single or multistory building. The flow of baggage, passengers and visitors can be separated horizontally in the former, while in the latter, baggage can be routed to a lower level while passengers and visitors use the floor above. The flow has to be planned to eliminate back-tracking, circuitous movements and unnecessary steps.

A system closely corresponding to CAA's ideal is planned for Cleveland's new terminal. There the departing passenger will enter a centralized ticket lobby, just a few steps from his car or bus, and check his baggage. He will go up one flight of steps to the waiting room and concession area, then down a ramp to his plane. Incoming passengers will ascend the same ramp, but walk down a separate flight of steps to pick up outbound baggage.

Every effort will be made to shorten the passenger travel to and from planes. At O'Hare, for example, the average distance he will walk is 735 feet, compared with an 1150-foot average to train cars at the city's railway stations.

Most new terminals will offer one or more striking innovations. Perhaps the most impressive yet completed is the \$10,-000,000 granite-and-glass structure at Greater Pittsburgh Airport. Almost a city in itself, within its seven stories are a 62-room hotel, a bank, shops, restaurants, a post office and a theater.

The Pittsburgh terminal has more than 6500 windows with a special glare-free glass that holds out solar heat. It is also believed to be the first terminal completely air conditioned and heated by natural gas.

St. Louis will have one of the most unusual main buildings, achieving what is termed the "great room" effect for its top, main floor by using an intersecting parabolic-vault-type roof. It will be an arch of reinforced concrete, about eight inches at its thickest and 32 feet above the floor at its highest point. There will be no supporting columns within the 420 by 120-foot room, allowing complete utilization of its floor space.

Below the main room, at automobile-roadway level and housing ticketing, waiting, restaurant and other concession facilities, will be two more floors. A lobby and return-baggage space will be on the second, which will be on a level with three "fingers" extending out toward the aircraft. Passengers will move through the fingers, each of which will have 16 plane positions, when boarding or arriving. The first floor, level with the aircraft parking apron, will be used for airline operational space, air mail, freight and express.

(Continued to page 260)

BIG VALUES for the Little Guy AT THE SMALL MAN'S TOOL HOUSE!

HIGH SPEED WOODRUFF KEY SEAT CUTTER

SET 5 different size cutters. Can be used as mounted milling cutter or circular saw. All with 3/8" and 1/2" shanks, widths up to 1 1/2", dia. up to 1". New and used. Ppd. \$3.95



NEW VICKERS MF9, 6 H. P.

Hydraulic Motor Unit is compact, powerful. Displaces .507 cu. in. per revolution. 6 gal. per min. at 3000 RPM, 1500 PSI. Positive displacement. Angle type. Rated at 6 H.P. Rotates either direction. Unit can also be used as a pump. Here is the finest hydraulic motor available at a fraction of its new cost of over \$200. Our price only..... \$19.95

7 SLITTING SAWS WITH MANDREL

SET 7 Different Size High Speed Slitting Saws, 5 pcs. 23/4" dia. x 1" arbor. Thickness from .040 to .071. Cuts wood, aluminum, brass, steel, etc. PLUS SPECIAL MANDREL which enables use of saws in 1/4" or 1/2" etc. drill. \$25 value. PPD. Only..... \$4.95



NEW MOUNTED STONES

SET Mixture of 27 12 Mounted Stones with 1/4" shanks. PPD. \$2.95



NEW ROTARY FILE MIX

7 different pcs., High Speed 1/4" shank. PPD. \$4.49



SET 14 different pcs. 22 as above. PPD. \$8.79

YOUR MONEY BACK if not satisfied. All mds. mixture of new and reconditioned unless specified new. All orders (except those specified F.O.B. Detroit) shipped postpaid saving you up to 25% on total delivered cost.

HIGH SPEED STRAIGHT SHANK DRILLS

SET 30 selected H. S. Straight Shank Drills from 1/8" to 1 1/2", lengths up to 7". \$15 value. only \$2.98



SET 100 HIGH SPEED DRILLS: 1/4" down. 19 30 new std. H. S. Drills - 70 slightly used sharp drills. lengths up to 7". \$30 value. PPD. Only..... \$7.98

SET 12 different size H. S. straight shank Drills. 1/4" to 1 1/2", lengths up to 7". Only..... \$3.98

HIGH SPEED DRILLS

1/4" TO 1 1/2" WITH 1/4" SHANKS!

SET 10 different size H. S. Drills. 1/4" to 1 1/2".

36 all with 1/4" shanks. PPD. \$4.95

Set 36L will fit any 1/4" drill.



HIGH SPEED DRILLS

1/4" to 1 1/2" WITH 1/4" SHANKS! 5 Drills for less than one new drill.

SET 5 different size H. S. Drills

32 1/4" to 1 1/2"..... \$7.95

SET 10 different size H. S. Drills 1/4" to 1 1/2"..... \$14.50

These new and used H. S. precision Drills with 1/4" shanks can be used in a 1/2" etc. drill or a 1/2" capacity lathe or drill press.

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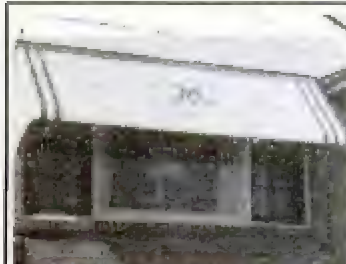
Helicopter landing pads are being planned adjacent to most new terminals. At Fort Worth International they've decided to separate rotary-winged craft from the others for maximum safety. The heliport will be on the opposite side of the administration building, in a fenced-off section of the parking area.

Many revolutionary proposals for handling airline passengers have not yet been tested. Swiss architect K. K. Perslee suggests building subterminals within cities and there loading passengers onto busses destined for specific airplanes, unloading them directly into the airplane. Ticketing and baggage checking would be done at the subterminal.

Similar to Perslee's idea is a "mobile gatehouse" suggested by O. M. Mosier of American Airlines. This is a double-deck bus for passenger travel between the terminal and airliners. Anticipating that noise and blast-heat objections might require tomorrow's jet transports to park and load some distance from the terminal, Mosier evolved the bus as the simplest means of bridging the space gap.

A two-story "air dock," adjacent to which airliners would be towed for servicing and, simultaneously, the unloading and loading of passengers, is being studied by United Air Lines. United believes it would eliminate most of the ramp vehicles that now clutter up the terminal area and shelter both passengers and servicing crews from inclement weather. Baggage could be moved back and forth on belt conveyors and service speeded through the use of fixed oil, fuel, pneumatic-air and electrical installations.

Radical as some of these suggestions may at first appear, aviation progresses so swiftly that they may be accepted as commonplace in three or four years. ★ ★ ★



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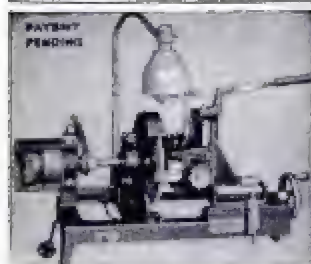
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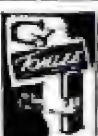
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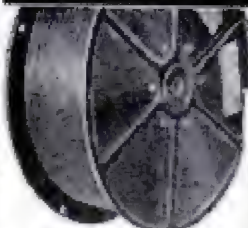
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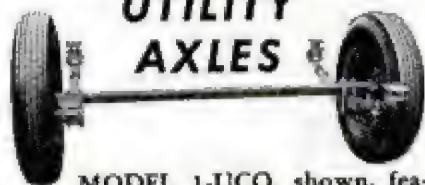


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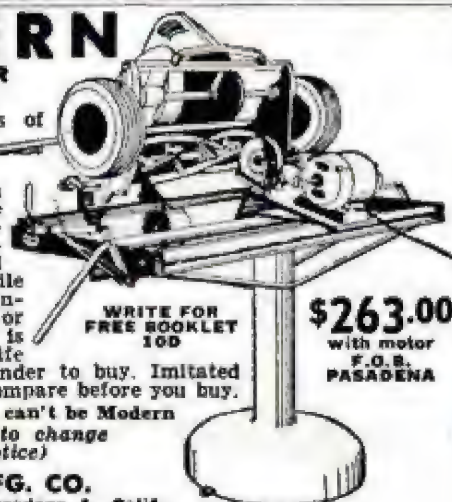
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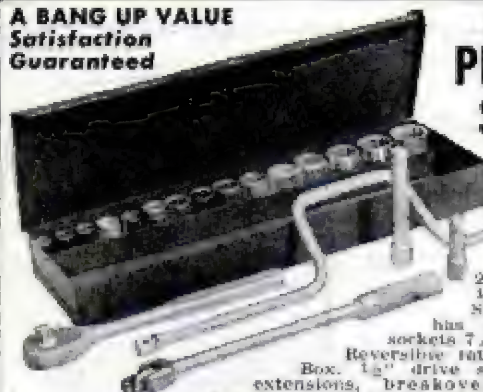
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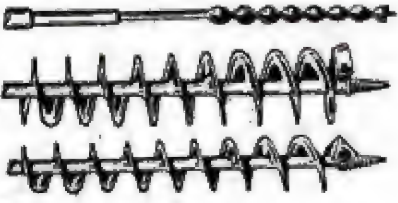
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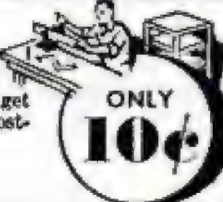
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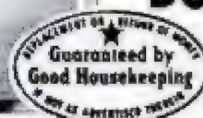
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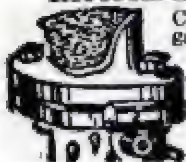
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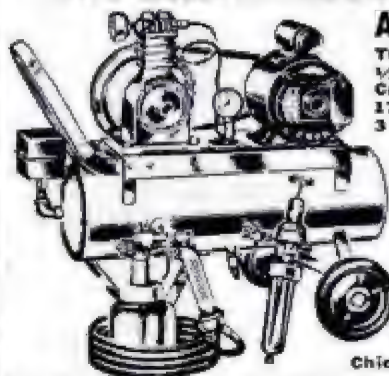
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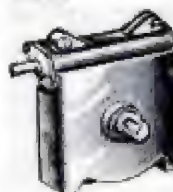
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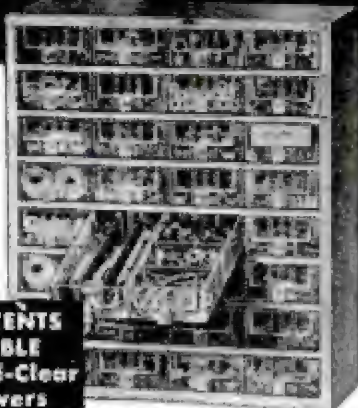
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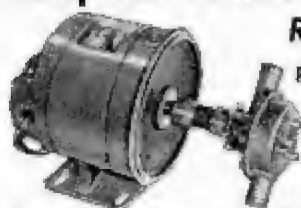


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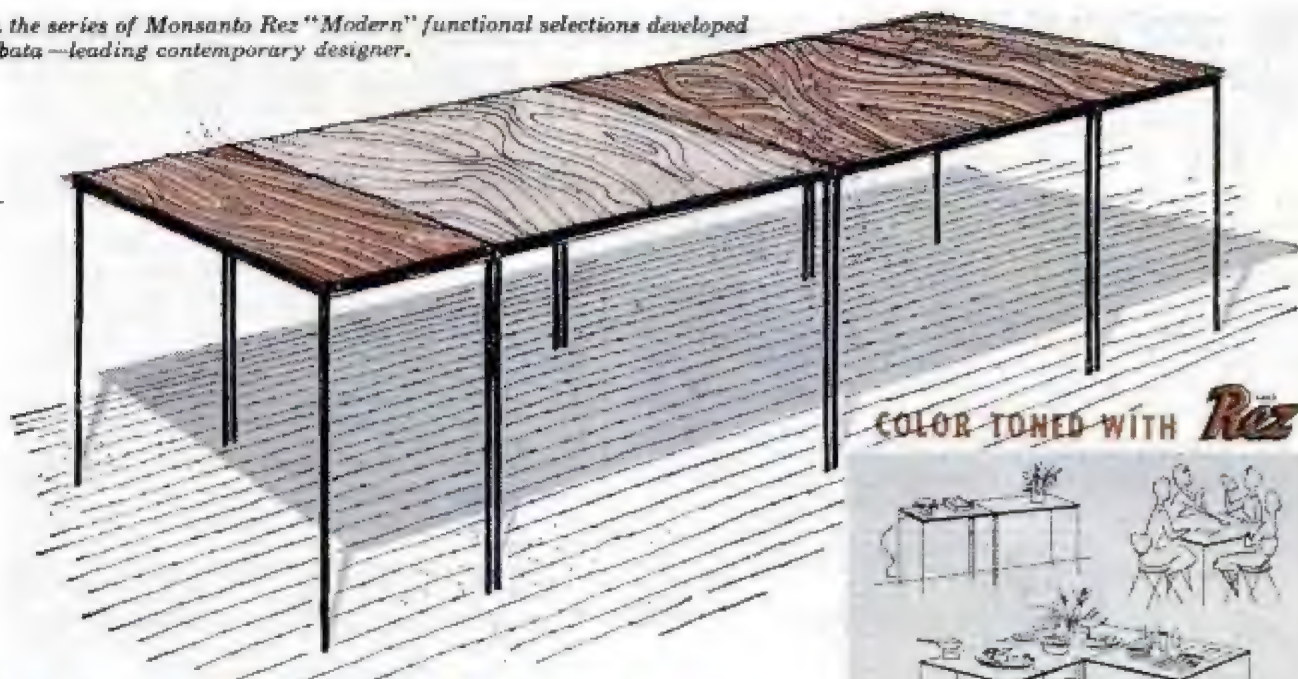
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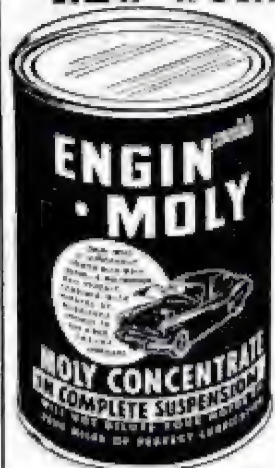
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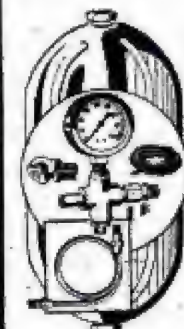
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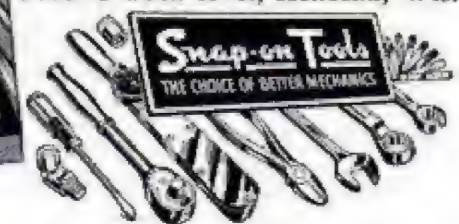
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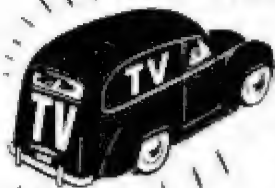
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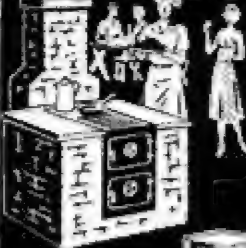
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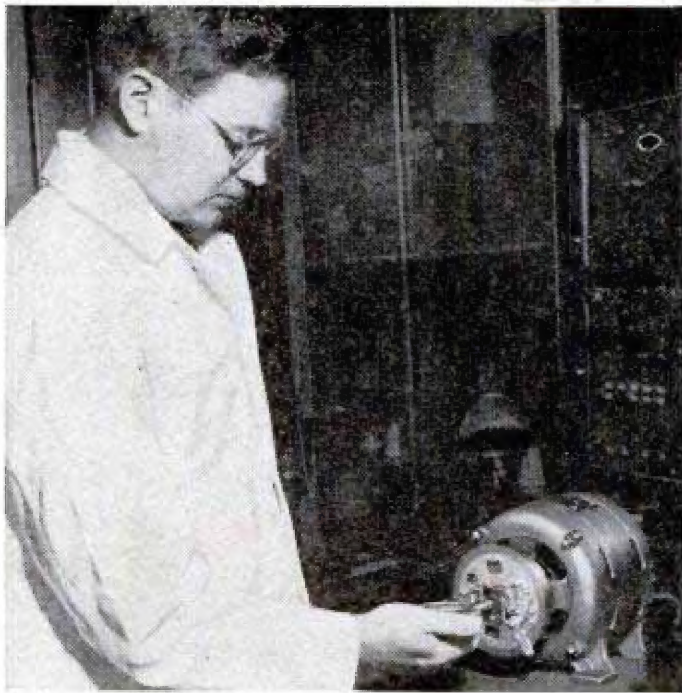
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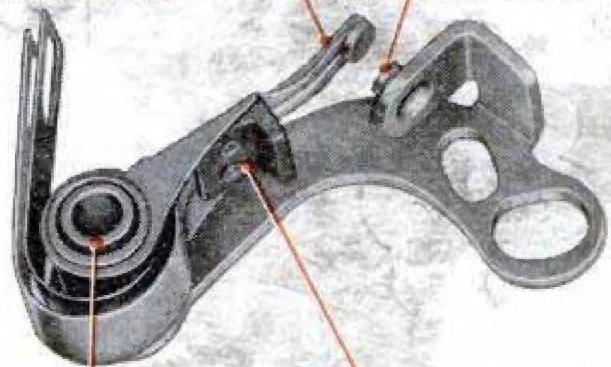
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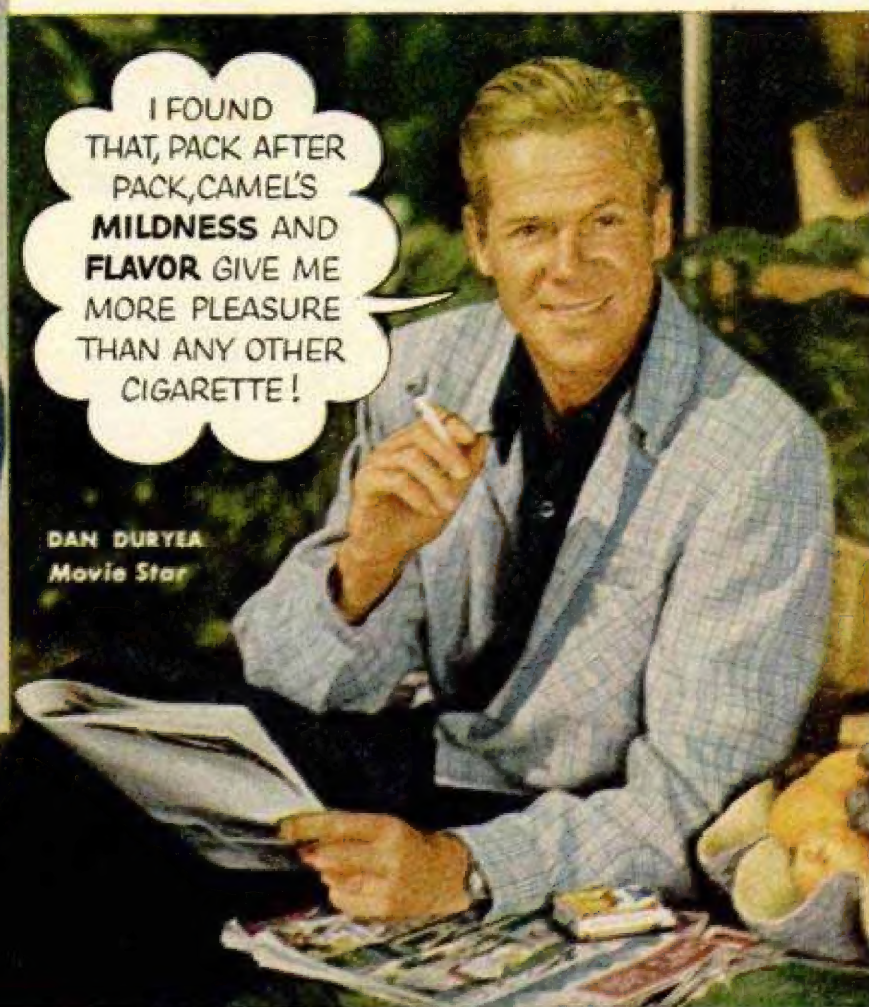
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